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ABSTRACT

The integrated learning activities in this guide were developed by a committee of educators from Osceola District Schools, Orange County Public Schools, and Valencia Community College (Florida) for a tech prep curriculum. Included are 32 communications-related activities, 30 mathematics activities, and 10 science activities. Each activity includes the discipline and/or the specific course for which it was designed. The topic, competency, and goal are specified, as well as the needed student preparation, materials needed, a description of how to implement the activity, what assessment might be done, the resources used for development, and who developed the activity. Examples of the topics are as follows: creating graphs and an explanation of the information in them; writing an essay on a topic based on the Cable News Network Business Daily Report; producing a thesis appropriate to issues of business and industry; international faxing; preparing for a job interview; developing a resume; gathering and analyzing information and analyzing information to build a swimming pool; using algebra to calculate drug dosage; calculating voltage; calculating the time it takes an object to fall; calculating prices based on inflation rates; using radioactive isotopes in medicine; and time value of money. (KC)

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ED 400 394

Integrated Curriculum Activities

TECH PREP

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"Integration of Vocational and Academic Learning Through Tech Prep"

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Orange County Public Schools
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CE 072 702

INTRODUCTION AND OVERVIEW

The Tech Prep Consortium of Orange County Public Schools, Osceola County Public Schools, and Valencia Community College was funded through a federal demonstration grant for the Integration of Vocational and Academic Learning and was received in 1993. The integrated curriculum activities were developed to meet the first objective of the grant proposal: to increase cross-departmental and inter-institutional faculty cooperation through the development of integrated vocational and academic curricula at the postsecondary level.

The members of the consortium had previously worked together in the development and implementation of Tech Prep programs. From this involvement, the members of the consortium identified integrated/applied learning as:

- Not changing what we teach, but how we teach
- Maintaining a strong academic content
- Being team-oriented
- Having multi-disciplinary connections
- Exposing students to real-life applications of academic and technical principles
- Having business and industry involvement

The Consortium members believe the need for creating integrated learning possibilities for students is essential in today's educational systems. Business and industry leaders have been telling educators that the employees of today and the future must not only have good technical skills, but must have the ability to think through a situation, diagnose a problem and respond with good judgment, and have self-control and autonomy. Integrated learning provides today's students with the opportunity to experience these situations in the classroom, enabling them to gain the competitive edge in the workplace of the future.

The model developed by this Consortium started with the expectation that graduates of postsecondary institutions would possess sound academic and technical backgrounds equipped with the skills and knowledge needed for success. For this reason, communications, math, and science were considered the disciplines that would have the greatest impact on student learning and were therefore selected as the subject areas where curriculum could be developed that would integrate concepts from the technical disciplines. The goals of the Integrated Curriculum were to:

- Improve the quality of secondary and postsecondary education
- Plan, design, implement, and evaluate integrated technical education and academic learning
- Develop a model for national replication

- Develop the integrated/applied curriculum by utilizing "real life situation" strategies and/or "applied instruction"
- Develop the integrated learning activities in the communications, mathematics, science, and technical education disciplines

The methodology utilized for the development of integrated learning activities began with the identification of appropriate administrators, faculty and staff from each of the three educational systems as well as interested members from the business and industry community. The individuals from the educational settings were selected because they expressed an interest in the project, were identified as leaders in their discipline, and were considered to be individuals having the ability to influence peers in order to bring about academic change.

The selected group of administrators, faculty and staff from Orange County Public Schools, Osceola Public Schools, Valencia Community College, and the business community first met for a one and one-half day staff development workshop. The purpose of this workshop was to enable individuals to begin thinking about their own values and beliefs related to the development of integrated/applied curriculum, to present information related to the changing needs of business and industry, to identify education's responsibility in meeting the workforce needs, and to address learning and teaching styles.

At this first workshop the integrated curriculum activity committees were established for the purpose of developing the learning activities. A committee was established for each of the three disciplines: communications, mathematics, and science. The membership of each committee was comprised of public school and community college faculty from the disciplines and faculty from appropriate technical disciplines; for example, nursing faculty were on the science committee, electronics faculty were on the mathematics committee, and business faculty were on the communications committee.

Following this initial workshop, the committees had several monthly meetings. The purposes of the committee meetings were to:

- identify the topics to use for curriculum activity development
- increase the representative secondary and postsecondary members awareness of what was currently being taught
- identify the current teaching methodologies used in various courses
- identify what learning content the communications, mathematics, and science disciplines could apply to the specific technical areas
- divide the membership into teams, of at least two, for the actual collaborative development of integrated learning activities.

The rationale for establishing teams of at least two individuals, with one representing the academic discipline and the other representing the technical discipline, was to encourage a greater cohesiveness across the disciplines and to provide an opportunity for learning from one another. Although the end product of this collaborative work was the actual integrated learning activity, the more important product for the consortium members was the process of learning from one another and the focus on how to teach the activities rather than what to teach in the activities.

This project and the development of the integrated learning activities did not proceed without its challenges. The first challenge was to address the concern for the need to maintain a strong academic focus without 'watering-down' the curriculum. This challenge was met as a result of the increased understanding of integrated/applied learning through the discussions which took place between the academic and technical faculty.

A second challenge was to integrate authentic tasks rather than forced activities. This challenge was met, again as a result of collaborative team work between members of at least two disciplines working together to better understand the 'real life' implications for the specific discipline.

A third challenge to overcome was in defining "real life situations" and determining what learning activities will best help a student apply learning to a "real life situation". This was a challenge which the educators struggled to fully understand and implement. However, one activity many educators had the advantage of participating in was the "Educators in Industry" program. This program facilitated postsecondary faculty's understanding of the relationship between their subject areas and real-life application through visitations to business community sites.

The final step for the committees was to develop a format for the integrated learning activities. What follows in this document are the developed activities designed for instructor use. The communications-related activities are designated with a C-1, C-2, etc., and likewise for mathematics, M-1, etc., and science, S-1, etc. Each activity includes the discipline and/or specific course for which it was designed. The topic/competency/goal is specified as well as the needed student preparation, materials needed, a description for how to implement the activity, what assessment might be done, the resources used for development, and who the developers of the activity were.

It is hoped you will utilize these learning activities as you facilitate the learning process for your students. Make alterations in these activities as needed. Please feel free to make as many copies as needed. Additionally, feedback as to the success or lack of success when using these strategies, would be greatly appreciated. The faculty who developed each activity are available for further inquiry.

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Equal Opportunity Agencies

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Acknowledgments

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Communications

Integrated Curriculum Activity
C-1

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
English
Humanities
Speech
Public Relations
Advertising
Economics

3. **Topic/Competency/Goal:** Students will learn to use research skills, communication skills, and applied strategies as could be found in a business-related environment.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Computer
Printer
Transparencies (optional)

2. Preparation for Activity/Prerequisite

Background research on Michelangelo, DaVinci, Bernini, to use during this activity.

B. Description of Integrated Learning Activity:

Students are given a job assignment to create the publicity for an art show that will feature the work of Michelangelo, DaVinci, and Bernini. They will work in the LRC to gather the data to support the news releases and promotion materials.

Students will compete for the job of publicist for one of the artists. They will create an oral presentation promoting the artwork in which they must thoroughly describe the content, style, media, and suitable interpretation.

Students will write copy that will represent the sale of the artist's work. The copy will be designed for a newspaper article, a brochure, and a magazine ad.

C. Assessment:

A panel of "experts" will judge the creativity and credibility of each piece of the promotion proposals.

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Culture and Values
Western Humanities
Related economic and advertising texts
Library research

6. Integration of Technical/Academic Courses:

Students will learn about the artists and their historical time while promoting the talent of these artists in a 20th century format. They will use work studied in a humanities class and apply it to the skills taught in a communication course, a speech course, and an economics course.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity **# C-2**		
1.	**Discipline/Course Unit:**	Freshman Composition I
2.	**Related Disciplines:**	English Office Skills Computer Word Processing Skill Research in LRC
3.	**Topic/Competency/Goal:**	Students will draft, revise, edit and produce a letter expressing personal concerns to the editor of a magazine or an elected official requesting action.
4.	**Integrated Learning Activity:** **A. Student Preparation** **1. Materials, Supplies, AV Equipment** Computer Printer Monitor	
	2. Preparation for Activity/Prerequisite Magazine selection of an essay for submission or identification and address of selected official with background research of issue to be addressed.	

B. Description of Integrated Learning Activity:

After selecting a magazine and writing an essay meant for that publication, students will write a letter to the magazine editor submitting the essay. In the letters, students must discuss how and why the theme and purpose of the essay were developed, what are its exceptional points, and why it should be published. The essay is attached to the letter and submitted to a peer writer/editor assigned by the instructor. The student-editor reads the essay and responds in a business letter that the magazine would like to publish the essay with the following revisions. A revised essay is turned in by the author for grading; then, submissions are actually sent to the magazines.

Alternative: students select a government official or business executive to whom they will send a request for action on an issue of the student's choice. After revision and editing, letters are mailed to the officials.

C. Assessment:

Evaluation of letters to the editor or government official.

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Library research
Guide to Periodical Literature

6. Integration of Technical/Academic Courses:

Workplace skills in written and oral communications are reinforced as students interact with editors in publishing fields, business leaders, or government officials. In most cases, students will receive responses from the officials contacted and often, the actions requested become a reality.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-3

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
English
All Technical Areas
Computer Science
Business Math

3. **Topic/Competency/Goal:** This activity will develop the students' ability to employ various modes of discourse. The focus of this lesson will require students to demonstrate a comparison and contrast of data and then effectively communicate in written narrative a summary of the variations of data.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Access to computers and appropriate software

      2. **Preparation for Activity/Prerequisite**

         Knowledge in using software

B. Description of Integrated Learning Activity:

Choosing a topic from business or technical course content, students will generate a graph depicting contrasting data. After creating the graph, they will exchange with another member of the class. After a study of the information given, a written narrative will be produced describing the variations in the data represented in the graph.

C. Assessment:

Both content of information depicted in graph and written narratives

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.

Access to and knowledge of computer software that will produce graphs in various forms such as pie charts, bar graphs, and line graphs

6. Integration of Technical/Academic Courses:

This assignment requires group interaction and replicates tasks the student will be asked to do in the workplace. They must be able to create a graph depicting information in an accurate and easily understood visual. They will then analyze and write the comparisons/contrasts of the information in narrative form.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-4

1. **Discipline/Course Unit:** Freshman Composition I
Unit 5
Exploring Modes of Discourse: The Comparison/ Contrast Eassy Assignment

2. **Related Disciplines:** Computer word processing skills, peer editing techniques, organizational skills, writing, speaking and listening skills, office skills, i.e., use of telephone and fax machine, research skills, collaborative learning, time management

3. **Topic/Competency/Goal:** Gather, organize, shape, revise and edit work to produce a Comparison/Contrast essay which both informs and provides information.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Fax Machine
Telephone
Computer/printer/monitor

2. Preparation for Activity/Prerequisite

Select two movies or two plays to attend. Review organizational patterns for a Comparison/Contrast essay. Complete background research on authors of works, director, actors, etc.

B. Description of Integrated Learning Activity:

After classroom discussion of organizational structures of the Comparison/Contrast essay form, and the selection of two productions to attend, students attend productions. In class, students discuss both productions. Working in small groups they develop several thesis statements. Students present various thesis statements to class, using overhead projector for ELMO. The class--as a result of the discussion, --chooses (1) a thesis and (2) an organizational plan to use when writing the comparison/contrast essay. Research material is incorporated in outline. First draft is written using a computer, all drafts are revised and saved. Peer editing requires each student to fax drafts to another student. In turn, each peer editor returns draft to author by fax. Students prepare an executive summary. Each student presents his/her executive summary to the class. Essays are graded by the instructor. (Critical Thinking skills: analysis, summarization, and evaluation. Writing skills.)

C. Assessment:

5. Instructor Resources/References:

Troyka's Handbook for Writers
Freshman Composition I text, The Bedford Reader, for research, both on-line and CD Rom.

Instructor provides support, coordinates activities facilitates class discussions, grades final essay.

6. Integration of Technical/Academic Courses:

Writing a comparison/contrast essay requires effective writing skills. Using research, gathering information, first hand reporting, i.e., attending productions, working in small groups, coming to a group consensus, giving presentations, providing executive summaries, and using the fax machines, etc., mirror the kinds of assignments and activities students can expect to find on the job. Being involved in the process of writing the essay also becomes a learning experience.

7. Developed by: **Date Developed/Revised: December 1995**

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2

Integrated Curriculum Activity
C-5

1. Discipline/Course Unit: Freshman Composition I

2. Related Disciplines:
English
Physical Education
Social Science
Art

3. Topic/Competency/Goal: This activity will challenge students to think logically, read effectively and efficiently, gather information, and use these skills and the products thereof to help them plan, write, and edit a documented essay.

4. Integrated Learning Activity:

A. Student Preparation

1. Materials, Supplies, AV Equipment

Books, periodicals, note cards, paper, pens, pencils, highlighters, television with tape recorder, audio tape recorder, word-processing equipment and appropriate program

2. Preparation for Activity/Prerequisite

Students must:

Attend a Magic basketball game and/or study Magic basketball films.

Interview at least one or more Magic basketball players and one coach, manager, or other team administrator.

Interview at least one newspaper or magazine sports writer and radio or television sportscaster.

Read "The Black and White Truth About Basketball," The Bedford Reader, 5th ed.

B. Description of Integrated Learning Activity:

1. Students will research, plan, write, document, revise, and edit a documented essay in which they analyze the style of play of the Orlando Magic (or any other team) to classify Magic style as either black or white or a combination, using as a source for definitions of these two styles, Jeff Greenfield's "The Black and White Truth About Basketball," a section in The Bedford Reader, 5th ed.

2. Teamwork is implicit in the activity. Students would collaborate on the project as a team, in groups of 2, 3, or 4 as they schedule interviews and time to plan and write, to procure money and to find time to attend Magic basketball games or watch them on television, use library resources effectively and efficiently.

3. After gathering information from all sources, students will organize and share knowledge in collaborative class sessions. They will analyze basketball and basketball teams as social organizational systems that constantly monitor and correct performance by all involved to compete successfully.

C. Assessment:

Periodic evaluation of the process and final evaluation of the product, the 1,000-word documented essay

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.
Learning resources concerning NBA basketball
Orlando Magic basketball history

6. Integration of Technical/Academic Courses:

In this activity, students learn to draw inferences and conclusions from evidence and to use those inferences and conclusions as springboards to collect more evidence. The study of the team as a social organizational system, interviews with management and players, and research in hard-copy sources allow students to understand the complexity of decisions in such systems. The culminating product of the documented research paper emphasizes skills needed in both the process and product of the entire activity.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#C-6

1.	**Discipline/Course Unit:**	Freshman Composition I
2.	**Related Disciplines:**	English Social Science Computer
3.	**Topic/Competency/Goal:**	This activity involves organizational, computer, interpersonal, communication, listening, research, and collaborative learning skills as students work in groups to brainstorm and place items in priority order for an essay on a topic based on the CNN Business Daily Report.

4. **Integrated Learning Activity:**

A. **Student Preparation**

1. **Materials, Supplies, AV Equipment**

Paper
Pens
Pencils
Computer
Audiovisual Equipment

2. Preparation for Activity/Prerequisite

Discuss and practice free writing technique, discuss organization of an essay, work in groups and small group dynamics, review reference sources for essay.

B. Description of Integrated Learning Activity:

After a general discussion of narrative and descriptive essay forms and brainstorming techniques, have students bring in examples of either form from current publications. Discuss common elements to be found in all examples. Using model from text, have students work in groups of three to four students to complete the same analysis for the text model. Discuss findings.

Have students work in same small groups to brainstorm possible topics for a similar essay. Have groups make a final topic selection and brainstorm the selected topic. Each group will elect a spokesperson. Using an overhead projector or similar audio visual equipment, the spokesperson will present the group's findings. As time permits, have each group write out an outline for an essay and share with the class. Once the topic has been selected and brainstormed, the outlines are to be prepared on the computer and copies of each outline printed for everyone in the class.

C. Assessment:

Evaluation of the process and final product

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.

Instructor may want to model the small group, brainstorming process

6. Integration of Technical/Academic Courses:

This activity uses strategies used by business in problem solving in the workplace. Collaborative learning with content from a business perspective increases the level of student performance in the classroom and, eventually, on the job.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-7

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
   - English
   - Psychology
   - Mathematics
   - Graphic Arts
   - All Technical Areas

3. **Topic/Competency/Goal:** Critical thinking, research, organizational skills, interview techniques, mathematical computation, and writing and drafting skills will be needed.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Word processor
         Paper
         Pen
         Drawing paper or photography equipment

      2. **Preparation for Activity/Prerequisite**

         Student will prepare a list of needs assessments for the job site, making a drawing or taking a picture if applicable and making a list of the other disciplines necessary to complete a finished idea.

B. Description of Integrated Learning Activity:

Students will design or develop a project which will improve their job site. They may improve on a working condition, improve a physical aspect of a plant, or improve upon an organizational problem at the job site. The students must name the end product of their goal; they must write a description of what the problem is and the steps that they would take to solve the problem. The students must detail all the disciplines or areas that are needed to create the solution including mathematical or drafting computations, color requirements or other physical or aesthetic changes they would make. The students should list the knowledge areas required to finish the task and any technology that would be needed. If the student has no job site, he or she may use a place often frequented. The final product will be a 500-word paper stating the problem in exact detail and talents or technology used to accomplish the solution or improvement. This final product may include drawings, graphs, or charts.

C. Assessment:

Periodic evaluation of the process and final evaluation of the product, the 500-word essay.

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.
Information on vocational and career videos

6. Integration of Technical/Academic Courses:

This activity is collaborative, multi-disciplinary, and applies to a career-oriented function. It also requires effective research, critical thinking, and effective writing skills using the tools of technology.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-8

1. **Discipline/Course Unit:** Freshman Composition

2. **Related Disciplines:**
English
Psychology
Mathematics
Graphic Arts
Related Technical Fields

3. **Topic/Competency/Goal:** Students will develop an idea from several ideas of other professionals in a field. Research and persuasive writing techniques will be used in composing a well-organized, structured paper.

4. **Integrated Learning Activity:**

A. **Student Preparation**

1. **Materials, Supplies, AV Equipment**

Pen
Paper
Word processor
Several magazines
Newspapers or other research materials particular to any career or field of interest
Writer's handbook

2. Preparation for Activity/Prerequisite

Students will need to find several articles or ideas about some phases of a career field which are of opposing viewpoints on any subject related to the field. The articles may be about the field in general, education necessary to function in the career, or some controversial technique or technology related to the field. These articles will need to be cited as documentation.

B. Description of Integrated Learning Activity:

Students will develop a graphic organizer using the pros and cons or opposing viewpoints about some phase of their career field or field of interest. The subject can be related to a job that they already do or one for which they are preparing. The viewpoints in the articles must focus on a specific topic or technology and all articles must be no more than four-years-old. The viewpoints must be listed on the graphic organizer and cited. The student will then create an introductory paragraph forming a new thesis about the subject. The student may create a one-sided thesis or one that presents both ideas. After the introductory paragraph has been peer edited, the student will do an entire paper on presenting the ideas that he or she formulated.

C. Assessment:

Peer editing and professor evaluation will be used.

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.

6. Integration of Technical/Academic Courses:

The students will choose how much of the technical part of a career field they wish to use in the paper, reinforcing critical thinking skills and decision making. The academics are addressed through the writings of a well-organized, sound, structured paper that draws from experts' ideas.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-9

1. Discipline/Course Unit: Freshman Composition I

2. Related Disciplines:
English
All Technical Areas
Computer Science
Business Math

3. Topic/Competency/Goal: This activity will develop the students' ability to employ various modes of discourse. The focus of this lesson will require students to demonstrate division of data and then effectively communicate in written narrative a summary of the relationship of divisions.

4. Integrated Learning Activity:

A. Student Preparation

1. Materials, Supplies, AV Equipment

Access to computers and appropriate spreadsheet software

2. Preparation for Activity/Prerequisite

Knowledge in using spreadsheet software

B. Description of Integrated Learning Activity:

Choosing a topic from business or technical course content, students will generate a spreadsheet using information on the topic. After creating the spreadsheet, they will exchange with another member of the class. After a study of the information given, a written narrative will be produced describing the relationship between the divisions represented in the spreadsheet. For example, if an automobile dealership wants to see the relationship of contacts of their sales staff to the number of cars sold by each associate, the division information would be compiled on a spreadsheet, and a summary of data written in narrative form.

C. Assessment:

Both contents of spreadsheet and written narratives

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Access to and knowledge of computer spreadsheet software

6. Integration of Technical/Academic Courses:

This assignment requires group interaction and replicates tasks the student will be asked to do in the workplace. They must be able to analyze divisions of information and express that analysis in narrative form.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#__C-10__

1.	**Discipline/Course Unit:**	Freshman Composition I
2.	**Related Disciplines:**	English All Technical Areas Computer Science Business Math
3.	**Topic/Competency/Goal:**	This activity will develop the students' ability to employ various modes of discourse. The focus of this lesson will require students to demonstrate the ability to classify data and then effectively communicate in written narrative a summary of the relationship of classifications.

4. **Integrated Learning Activity:**

A. **Student Preparation**

1. **Materials, Supplies, AV Equipment**

Access to computers and appropriate database software

2. **Preparation for Activity/Prerequisite**

Knowledge in using database software

B. Description of Integrated Learning Activity:

Choosing a topic from business or technical course content, students will generate a database of information on topic broken into various classifications. After creating the data bases, they will exchange database with another member of the class. After a study of the information given, a written narrative will be produced describing the relationship between the classifications represented in the database. For example, if a drafting firm is contemplating a large purchase of computers, the database might classify the company's needs, the features of various computer brands, and the cost involved.

C. Assessment:

Both contents of database and written narratives

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Access to and knowledge of computer database systems

6. **Integration of Technical/Academic Courses:**

This assignment requires group interaction and replicates tasks the student will be asked to do in the workplace. They must be able to analyze the classification of information and express that analysis in narrative form.

7. **Developed by:** **Date Developed/Revised: December 1995**

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Integrated Curiculum Activity
C-11

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** English
Computer Science
Business

3. **Topic/Competency/Goal:** The primary purpose of this activity is to proofread an essay and correct grammatical and mechanical errors.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Access to computer and word processing software

      2. **Preparation for Activity/Prerequisite**

         Students must determine how much time to allot for drafting, typing, and proofreading their essay to be used in this activity.

B. Description of Integrated Learning Activity:

Students will pair together as peer editors to proofread each other's essays for correct grammatical and mechanical usage. To accomplish this, the students will use computer based grammar and spell checkers. Students will demonstrate the following computer skills: file saving, disk writing, disk loading, use of grammar and spell checkers, and printing. For the final product, the students will produce a corrected document.

C. Assessment:

Evaluation of the process and final document

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Access and knowledge of appropriate word processing software

6. **Integration of Technical/Academic Courses:**

In this activity, students select appropriate word processing packages. In using these, basic skills in working with programs such as spell and grammar checks are reinforced. It also reinforces interpersonal skills as students evaluate suggestions and make corrections to their work.

7. **Developed by:** **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-12

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
English
Computer Word Processing
Social Science

3. **Topic/Competency/Goal:** The primary goal of this assignment is to introduce students to the importance of collaborative learning in preparing a document. Students will complete this activity using the computer and peer collaboration in the problem solving process that typifies strategies used to solve problems in business and industry.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Access to computer and appropriate software

      2. **Preparation for Activity/Prerequisite**

         Students will need to be familiar with computer software and must be able to use a computer mail or bulletin board system.

B. Description of Integrated Learning Activity:

Students will collaborate in using mail and bulletin board systems to research a current issue in business and industry. After gathering information, students will write an editorial on the issue. They will collaborate with peer editing before sharing their views of a computer mail or bulletin board system.

C. Assessment:

Instructor and peer assessment of editorials for validity, appropriateness and usefulness of the views presented. They will also be assessing the process.

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.

Access to and knowledge of computers, a variety of software programs, computer mail and bulletin board systems.

6. Integration of Technical/Academic Courses:

Basic skills will be reinforced through this activity because they will need to read and edit their peers' editorials. They must be able to give constructive criticism and make tactful suggestions for corrections and improvements.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#__C-13__

1.	**Discipline/Course Unit:**	Freshman Composition I
2.	**Related Disciplines:**	English Computer Word Processing Social Science
3.	**Topic/Competency/Goal:**	The primary goal of this assignment is for students to develop a thesis statement from a topic related to a workplace/workforce issue using a computer software program such as Word Perfect.

4. **Integrated Learning Activity:**

A. **Student Preparation**

1. **Materials, Supplies, AV Equipment**

Access to computer and appropriate software

2. **Preparation for Activity/Prerequisite**

Students will need to be familiar with writing thesis statements, what a thesis is, and how to compose one. They should also be familiar with the word processing software program that they will be using.

B. Description of Integrated Learning Activity:

Thesis statement should be developed from such topics as: gender issues in the workplace, compensation issues, performance and evaluation issues in the work place. This will require drawing such issues from assigned readings and research of these issues in the workplace. Students will peer evaluate the thesis statements for clarity, support, and accuracy.

C. Assessment:

Periodic evaluation of the process and final instructor evaluation of the final thesis statements

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Access to and knowledge of computers and software programs

6. Integration of Technical/Academic Courses:

Students will be perfecting their word processing skills while producing a thesis appropriate to issues of business and industry

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-14

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
Literature
Business
Accounting
Hospitality and Tourism
Geography
History
Public Relations

3. **Topic/Competency/Goal:** To develop a sense of the travel and tourism industry through the preparation of advertising material for a trip to a famous author's homeland or to the setting of a literary piece. It will require research skills, critical thinking skills, problem-solving skills, communications skills, and a sense of the impact of history on travel.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Computer
Printer
Zerox
Transparencies

2. Preparation for Activity/Prerequisite

B. Description of Integrated Learning Activity:

Students are to create a promotional package for a particular location. Students will start by selecting either the birthplace or living place of a prominent author. The student will make this location the destination for a travel client.

Students will work in the library researching the geographic area selected and the relationship of this area to their writer.

Students will interview travel agents to determine process for preparing a travel itinerary. The tour package will include pricing, routes, and activities.

Students will create a promotional piece that will entice a traveler and provide specific background on the location. They will also prepare a three-to-five minutes oral presentation to enhance the written assignment.

C. Assessment:

Instructor evaluation of the process, presentation, and promotional written piece

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Literature: An Introduction to Reading and Writing by Edgar Roberts and Henry Jacobs
Text for hospitality and tourism
World atlas

6. **Integration of Technical/Academic Courses:**

Students will learn about the tourism industry as it relates to a variety of positions from ground transportation to land packages. They will learn about the work and geographic location related to an important literary figure. They will apply problem-solving and accounting skills.

7. **Developed by:** **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-15

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
Literature
Science
Communications
History
Computers

3. **Topic/Competency/Goal:** To write a monster story that will compare and contrast the technology related to the creation of twentieth-century monsters with the creation of Mary Shelley's Frankenstein. This integrated project will challenge the students to use creative thinking skills and an understanding of technology to answer the question: What/who are the monsters of the twentieth century?

4. **Integrated Learning Activity:**

A. **Student Preparation**

1. **Materials, Supplies, AV Equipment**

Computer
Printer
Zerox
Transparencies

2. **Preparation for Activity/Prerequisite**

Students must read Mary Shelley's Frankenstein. Students will also develop a focus centered on some aspect of technology today and the influence of that technology on society.

B. Description of Integrated Learning Activity:

Students will read about Mary Shelley and the creation of her monster. They will need to develop a definition of a monster and decide if one can be a monster simply by nature or if society gives birth to the monster. Library research will be necessary to find related materials on Shelley's work and recent interpretations of her thesis.

Using resources from health-related courses, students will investigate the processes involved in invitro-fertilization and test-tube reproduction. They will use material related to these areas to define the life force within technology.

The final product will be a conceivable, realistic, and well-documented narrative comparing and contrasting monsters of technology to that of Mary Shelley's Frankenstein.

C. Assessment:

Final piece of writing will be analyzed for its explanation of the responsibilities of a creator

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Frankenstein by Mary Shelley
Texts from science and health courses

6. Integration of Technical/Academic Courses:

Students will learn about the relationship between time periods as seen through the eyes of a classical author and the student's research from this century. They will learn that other disciplines need to be included in research to make it effective and credible. They will apply skills from communications, science, and computers to produce a conceivable, realistic, well-documented piece of writing. They will present a global view of historical vs. present-day technology.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-16

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
Economics
Business
Speech
Accounting
All Areas of Employment

3. **Topic/Competency/Goal:** Students will learn to move from an independent mode of learning to a dependent one as they work as a team in a group project similar to conditions found in the workplace. Students will need to employ joint research, survey, compilation, synthesis skills as they create a persuasive presentation.

4. **Integrated Learning Activity:**

A. **Student Preparation**

1. **Materials, Supplies, AV Equipment**

Computer
Printer
Zerox
Transparencies
Overhead Projector

2. Preparation for Activity/Prerequisite

Students will need to be assigned to a team and the team must select a company listed on the New York Stock Exchange to research during this activity.

B. Description of Integrated Learning Activity:

Students will be assigned as panels to research and discuss a company listed on the New York Stock Exchange. Their objective is to present a persuasive presentation about the benefit of investing in this company. Student will need to assign portions of the work to each group member with every member making a specific contribution to the final presentation.

Students will need to learn some basic terms related to the stock market and investing business. They must be able to clarify these terms with definitions and examples for their clients.

Students will synthesize information in preparing overheads or visuals that will help their clients draw the conclusions expected for the presentation.

C. Assessment:

Both peer and instructor evaluation of presentation and persuasive strategies will be done.

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Wall Street Journal
Economic and business texts
Variety of newspapers containing stock market report

6. **Integration of Technical/Academic Courses:**

Students will learn that working in groups takes tolerance and teamwork. They will learn individual strengths and weaknesses within the group and how to use resources effectively.

7. **Developed by:** **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#__C-17__

1. Discipline/Course Unit: Freshman Composition I

2. Related Disciplines:
Communications
Speech
Literature
Business

3. Topic/Competency/Goal: Students will summarize, be selective in giving specific and concise information, and learn the planning process in creating an agenda for a business meeting to determine whether or not the work of an author will be published.

4. Integrated Learning Activity:

A. Student Preparation

1. Materials, Supplies, AV Equipment

A/V Equipment
Computer
Printer
Zerox
Anthology

2. Preparation for Activity/Prerequisite

B. Description of Integrated Learning Activity:

Students will select an author from an anthology who will become a client in search of a publisher for their work. Students will gather information from the library that will give thorough background data related to the author's work.

Students will plan and develop a strategy for a promotional presentation to the publishing panel. This strategy must then be condensed to fit the form of a meeting agenda consisting of an introduction, body, and conclusion. In synthesizing the strategy for the agenda, students will study various styles of meeting agendas used in business.

Students will submit agendas and will demonstrate the procedures of their plan.

C. Assessment:

Students will be evaluated on their ability to be problem-solvers who can provide an organized approach to achieve desired results.

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Literature: An Introduction to Reading and Writing by Edgar Roberts and Henry Jacobs
Applicable business writing text

6. Integration of Technical/Academic Courses:

Students will learn about a literary figure while developing a relationship with the style and content of the author. They will use strategic planning and apply it to a working environment.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#__C-18__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
English
Office Skills
Computer Word Processing Skill
Research in LRC

3. **Topic/Competency/Goal:** Students will draft, revise, edit and produce a letter providing information derived from research in response to a written request for specific information.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Computer
         Printer
         Monitor

      2. **Preparation for Activity/Prerequisite**

         Students will need to research to find meaningful data to create response to a written request. Outside speakers or job shadowing assignments with local agencies would be helpful.

B. Description of Integrated Learning Activity:

Students respond to a written request, ostensibly from out of state, for information concerning local hospitals, transportation real estate, schools, entertainment and/or job opportunities. The student will be responding as though he/she was a realtor.

C. Assessment:

Review of process and final written response

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.

Establishing contact or creating list of possible contacts with local agency and business partners

6. Integration of Technical/Academic Courses:

Actual data must be obtained through research by the students. This project will emphasize the reality and complexity of a community in providing the information requested.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#___C-19___

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** All discipline/employment areas

3. **Topic/Competency/Goal:** Students will engage in activities and produce products involving higher order thinking skills.

4. **Integrated Learning Activity:**

    A. **Student Preparation**

        1. **Materials, Supplies, AV Equipment**

            Model such as attached Bloom's Taxonomy of critical thinking skills

        2. **Preparation for Activity/Prerequisite**

            Knowledge of a word processing software program, grammar and writing rules

B. Description of Integrated Learning Activity:

Using a text from a class writing or reading assignment, students will break into small groups of three to five, review the handout used as a model for higher order thinking skills, choose activities from the areas of knowledge, comprehension, application, analysis, synthesis, evaluation, and produce a product in each area related to the text. The activities and products such as films, court trial, survey, advertisement, song, diagram, report, scrapbook, puzzle, photographs, or diary are produced as a team effort. Each member of the team will be assigned to write one narrative telling about one of the products developed. The narrative although brief, must tell about the process, activities, and research used to develop the product as well as a description of the product along lines of a research abstract.

C. Assessment:

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.

Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.

6. **Integration of Technical/Academic Courses:**

This activity requires students to use research tools, evaluate data, as well as capitalize on each other's strengths in developing the final product.

7. **Developed by:** **Date Developed/Revised: December 1995**

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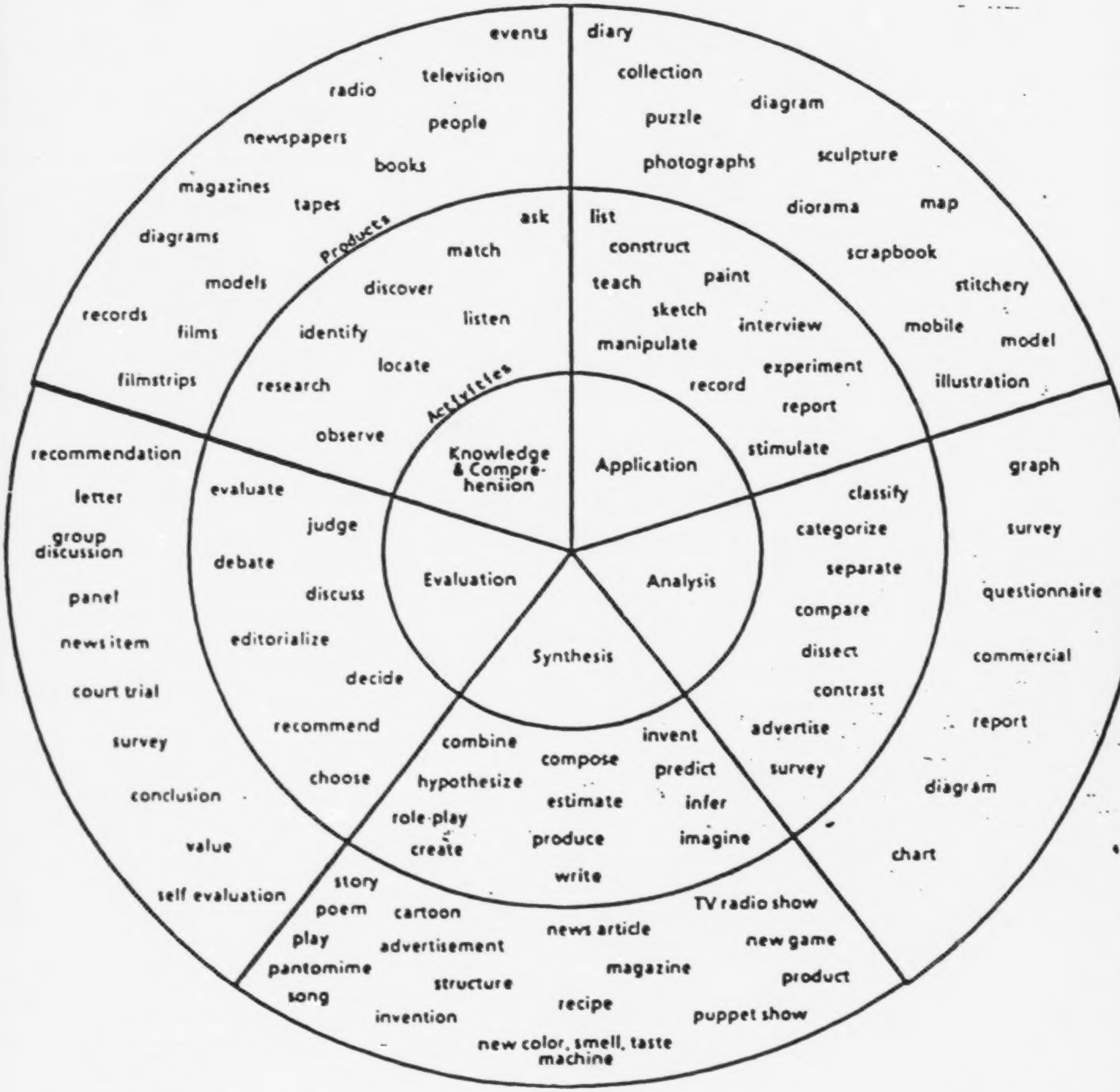
WHAT ARE THE USEFUL MODELS FOR DESIGNING CURRICULUM?

BLOOM'S TAXONOMY


Knowledge & Comprehension
Application
Analysis
Synthesis
Evaluation
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Products
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role-play
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produce
imagine
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poem
cartoon
play
advertisement
news article
TV radio show
new game
pantomime
structure
magazine
product
song
invention
recipe
puppet show
new color, smell, taste machine
evaluate
judge
debate
discuss
editorialize
decide
recommend
choose
recommendation
letter
group discussion
panel
news item
court trial
survey
conclusion
value
self evaluation

ASAP152 – 12-4-91

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Integrated Curriculum Activity

#__C-20__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** This activity is related to all discipline/employment areas

3. **Topic/Competency/Goal:** To have students use work-related technology and become familiar with international communication conventions.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Access to Merriam-Webster's Guide to International Business Communications by Toby D. Atkinson. Access to encyclopedia information on CD ROM or other resources such as written Cultural Grams or electronic information researched over the Internet or E-Mail. Access to a fax machine.

      2. **Preparation for Activity/Prerequisite**

         Knowledge of international communication conventions and procedures to fax a document.

B. Description of Integrated Learning Activity:

Business operations have become more global and communications by fax, phone, and written or electronic correspondence have become more international. This activity focuses on acquainting students with the information needed to communicate in this global society so that no embarrassing protocol errors are made. Students will use Merriam-Webster's Guide to International Business Communications by Toby D. Atkinson as a reference. This book provides important information for addressing correspondence to 36 countries and country-specific traditions. Included is also information on selecting computer hardware for international use and trouble-shooting international phone and fax problems. Rules for addressing correspondence and explanations of customs are given.

Team Activity: Students will work in pairs. Students will select a character from one of their reading assignments in Freshman Composition. The character selected must not be from the student's native country. Students must also choose a character from a country different than their partner's.

Students will compose a one-page informational sheet about their character by completing the attached sheet. In order to complete the informational sheet, students must research basic information about the country that their selected character lives in including cultural facts and the proper way to address correspondence to that country. Merriam-Webster's Guide to International Business Communications gives students the rules for addressing correspondence as well as explanations for correspondence customs. For example, it is explained that in Chile and other Spanish-speaking countries, individuals write their given name followed by their father's family name and then their mother's family name; therefore, people are referred to by the middle name on their business cards. Correspondence to Eduardo Sanchez Viejo should be addressed to Sr. Sanchez, not Sr. Viejo, and Sr. (Mr.) usually goes on a line by itself as the first line of the address.

Students will fax their informational sheet to their professor and to their partner's residence or to a public business such as a copy center with fax sending/receiving services.

C. Assessment:

Individual (professor evaluation). Students will be graded according to the following: **Grading Criteria for Assignment**

1. Faxed informational sheet was received by both the professor and student by the deadline established.
2. All information on the faxed information sheet is accurate.
3. All requested information on the faxed informational sheet was completed.
4. All information on the faxed informational sheet was free of grammatical, technical/mechanical, and punctuation errors.
5. The narrative portion of the information sheet was written in correct person and good writing techniques were used.

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.

6. Integration of Technical/Academic Courses:

Students working cooperatively must use various technology to gather and disseminate data.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-21

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** This activity is related to all discipline/employment areas

3. **Topic/Competency/Goal:** To have students explore current topics in their potential field of employment; analyze, extract or infer information from reading; make associations between professional reading and assigned class readings; write a short grammatically correct paper.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Professional journals for the discipline area or field in which the student wishes to find employment. Access to a computer with word processing software.

      2. **Preparation for Activity/Prerequisite**

         Knowledge of a word processing software program, grammar and writing rules.

B. Description of Integrated Learning Activity:

Individual Activity: Students read three articles from two professional journals in the field in which they wish to find employment and analyze the traits of the individuals in the articles or determine the traits an individual would need to have in order to successfully produce the results, method, event, or new procedure discussed in the article. Using the table feature of a word processing program then record these character traits (Example: patient, creative, caring, persistent, conservative, structured, unafraid, research oriented, people oriented, ability to work under pressure, ability to work unsupervised, ability to pay attention to detail, etc.

Students analyze characters in the assigned readings for their Freshman Composition 1 class and select three who display the character traits entered in their table. Students select one character from the three and using word processing software write a one-to-two page paper justifying or hypothesizing why the character would be successful in the career or performing an event discussed in one of their professional articles. Student should use the spelling, grammar, thesaurus, and other features of the software.

Team Activity: Students determine if they have selected some of the same characters from their class readings who have the character traits needed to be successful from their professional readings. Students make a matrix chart listing the professions they wish to enter at the top and down the side a combined list of the character traits from each members' table of character traits. Students enter X's in the table to indicate the similarities and differences of character traits needed to be successful in various employment fields.

C. Assessment:

Individual one-to-two page paper

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.

6. Integration of Technical/Academic Courses:

This activity promotes professional reading, encompasses skills needed for collaborative work, and calls for a final product produced with the use of technology.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-22

1.	**Discipline/Course Unit:**	Freshman Composition I
2.	**Related Disciplines:**	All disciplines and technical areas
3.	**Topic/Competency/Goal:**	Students will understand and use outlining as a tool in writing and extracting the main elements of text.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Access to a computer with word processing software

      2. **Preparation for Activity/Prerequisite**

         Knowledge of a word processing software program

B. Description of Integrated Learning Activity:

Individual Activity: Students will read different assignments from required reading in Freshman Composition, from business newspapers such as Wall Street Journal, Investors Business Daily, New York Times, or professional journals. Acting as a journalist for the local newspaper, they will use an outline to draft and write an article about the story. Students must write the article so that it is accurate, succinct, and includes all main information but leaves out flowery prose and repetitious details. The outlining, newspaper, column, spell check, grammatical check and thesaurus features of the word processing software should be used in the writing process. Students should save their original outlines.

Team Activity: Students will exchange newspaper articles and make an outline from their colleagues' newspaper article and then compare this outline to the original.

C. Assessment:

Student newspaper articles and collaborative process of using outlines

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.

6. **Integration of Technical/Academic Courses:**

After interacting in teams, students must apply technology to specific tasks while focusing on reading and writing skills.

7. **Developed by:** **Date Developed/Revised: December 1995**

Linda Mallinson
Communications Committee

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Orlando, FL 32802

Integrated Curriculum Activity
#__C-23__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** All disciplines and technical areas

3. **Topic/Competency/Goal:** Students will explore and make associations between current topics and assigned class readings; analyze, extract or infer information from reading; write a short grammatically correct paper.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Access to a computer with word processing software

      2. **Preparation for Activity/Prerequisite**

         Knowledge of a word processing software program, grammar and writing rules

B. Description of Integrated Learning Activity:

Individual Activity: Students select a theme from one of their assigned readings for Freshman Composition such as business globalization, re-engineering and downsizing in the workplace, cultural diversity and valuing diversity in the workplace. Using graphic organizers such as mapping and webbing, students outline the causes (behavior of events) and effects (outcomes) related to the theme in the story. Students then read a current newspaper article, book, play, or see a movie that focuses on the selected theme and produce another graphic organizer showing causes and effects from that medium. Students then write a short paper about their selected theme and compare the causes and effects found in their assigned readings to those found in their outside reading or viewing. Word processing software should be used to write the paper.

Team Activity: Without telling other team members their theme, students see if they guess the effects (outcomes) of events when given behavioral characteristics (causes).

C. Assessment:

Student paper. Peer editing and professor evaluation

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.

6. **Integration of Technical/Academic Courses:**

Students must understand the causes and effects of the workings of systems as they gather and analyze information and then express their findings in writing.

7. **Developed by:** **Date Developed/Revised: December 1995**

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Orange County Public Schools • Osceola District Schools • Valencia Community College

Integrated Curriculum Activity
#__C-24__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** This activity is related to all discipline/employment areas

3. **Topic/Competency/Goal:** To have students explore current topics in their potential field of employment; analyze, extract or infer information from reading; make associations between professional employment requirements and assigned class readings; use business/computer applications; write a short grammatically correct paper.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Access to a computer with word processing software

      2. **Preparation for Activity/Prerequisite**

         Knowledge of a word processing software program, grammar and writing rules. Fundamental knowledge of a career field.

B. Description of Integrated Learning Activity:

Individual/Team Activity: Students break up into groups according to their majors or career interests. Their group assignment is to determine what positions would be necessary to staff a team related to their educational field. Examples: education -- administrators, technology coordinators, teachers; health -- dentist, receptionist, technicians, nurses, doctors, etc.; business -- office staff, maintenance staff; technology trainers, repair technicians, etc. Each student would write a job description for one or two positions. Students should use the spelling, grammar, thesaurus, and other features of the software.

Students would review the job descriptions written individually and then as a group select characters from assigned readings in their Freshman Composition 1 course to fill each of the job descriptions.

C. Assessment:

Student job descriptions. Peer editing and professor evaluation

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.

6. Integration of Technical/Academic Courses:

Students must understand the social and organizational systems of their career field while using effective writing skills to produce job descriptions.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity

#__C-25__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** All technical fields

3. **Topic/Competency/Goal:** Student will use effective self-expression and writing skills to produce a resume and cover letter.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Computer software and hardware

      2. **Preparation for Activity/Prerequisite**

         Interviews with partners regarding all areas of a resume: name, address, phone number, education, experience, skills, awards, honors, membership in professional organization, and a list of references.

B. Description of Integrated Learning Activity:

Students will compose a resume and a job application letter which will best represent an applicant's abilities, interests, and talents. This resume will persuade the reader that the applicant is directed, qualified, experienced, and educated regarding the desired employment. The standard areas and format of a resume and job application letter should be used.

This can be tied to technical areas and readings from course requirements by assigning the resume to be written for either an historical figure such as Alexander Graham Bell, or a current business personality such as Bill Gates or Lee Iacocca.

C. Assessment:

Final letters and resumes assessed on a holistic scale in both technical and academic courses

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.

6. Integration of Technical/Academic Courses:

This activity creates an awareness of personal attributes necessary for employment as it requires research of the challenges one faces in the workplace and demands effective written expression from the student.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
C-26

1. Discipline/Course Unit: Freshman Composition I

2. Related Disciplines: English
All technical areas

3. Topic/Competency/Goal: Introduction to technical writing in the workplace will help learners realize that technical writing is done in a variety of settings. Students will be able to communicate clearly as they accomplish writing tasks.

4. Integrated Learning Activity:

A. Student Preparation

1. Materials, Supplies, AV Equipment

Books
Pen
Paper
Dictionary
Newspapers
Magazines
Manuals
Computers

2. Preparation for Activity/Prerequisite

Pre-test on technical writing terms

B. Description of Integrated Learning Activity:

Student will be introduced to technical writing specifically the characteristics of accuracy, clarity, completeness, conciseness, organization, and correctness. They will study models of various forms of technical writing including sales letters, reports, memos, proposals, description, instructions, and training materials.

C. Assessment:

Selection of a technical form of writing and demonstrating effective characteristics

5. Instructor Resources/References:

Forlini's Grammar and Composition
Troyka's Handbook for Writers, 3rd ed.

6. Integration of Technical/Academic Courses:

Skills of technical writing will be integrated with content of technical courses in producing sales letters, reports, memos, proposals, descriptions, and training materials.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#__C-27__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
English
Business
All technical areas

3. **Topic/Competency/Goal:** The purpose of this activity is to teach students to compose a career portfolio which explores abilities, interests, and talents needed in a career choice.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Computer software
Career manuals
VCR tapes
Interviews

2. Preparation for Activity/Prerequisite

Research career choice in a minimum of five sources; write a one-page explanation for this choice.

B. Description of Integrated Learning Activity:

Students will select a fictional character from their reading and explore an occupation or career for this character. This exploration will require estimation time and preparation needed to obtain credentials for this career, comparing advantages and disadvantages of the career pursuit, and documentation of the exploration in a career portfolio.

C. Assessment:

Evaluation of portfolio for effective written communication and evaluation of process of career exploration

5. Instructor Resources/References:

Fear and Schiffhort's Short English Handbook #3
Forlini's Grammar and Composition
Kennedy, Kennedy and Aaron's The Bedford Reader, 5th ed.

6. **Integration of Technical/Academic Courses:**

Vocational exploration is required to create a career portfolio that has real world applications.

7. **Developed by:** **Date Developed/Revised: December 1995**

Sally Cunningham
Communications Committee

INFORMATIONAL SHEET

Enter the following form on a computer and fill in the information requested. Fax the completed form to your professor and to your partner by the established deadline.

Your Name:________________ **Your Partner's Name** ________________

The Name of the Character you have chosen ________________________
Character was taken from which story ______________________________
The character you chose lives in __________________________________

I used the following resources/books to complete this assignment:

If you were going to send a letter to your character, how would you address the correspondence?

If you wanted to communicate with your character using the phone, what time would you have to make the call so that your character receives it at midnight?

If you wanted to electronically communicate with your character using a computer, how would you do so?

Tell what the daily life of your character is like. Use first person. (Example, my name is Tina Pham. I live in Viet Nam where my day begins at 5:30 a.m.) Include information about family customs, religion, and education. Explain a little about the culture of the country that your character lives in through your narrative.

Integrated Curriculum Activity
C-28

1.	**Discipline/Course Unit:**	Freshman Composition I Unit 5: Exploring Modes of Discourse: The Argument Essay
2.	**Related Disciplines:**	Computer Skills Interviewing Skills (Listening, Speaking) Research Skills Interpersonal Skills Collaborative Learning
3.	**Topic/Competency/Goal:**	Using interviews to establish points of view vis a vis a current topic of popular interest surrounded by misinformation. Gathering, organizing, shaping, and editing that information into an argument essay that explores more than one point of view. Writing a balanced argument essay, using facts and opinions identified as such in the essay.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Recorder
Computer
Printer
Monitor
Review of the argument form

2. Preparation for Activity/Prerequisite

Library research on the chosen issue, for example:
IMMIGRATION, i.e., The effect of U.S. immigration Policy on the number and ethnic make-up for the new immigrant;
Stereotypical views held by Americans of the new Americans;
Reasons immigrants want to come to the United States.
Reasons given for limiting or expanding immigration quotas.

B. Description of Integrated Learning Activity:

In class, students will review the argument essay form. Students will bring in examples from newspapers, magazines, of argument essays. Working in small groups, students will analyze the examples drawn from contemporary sources, identifying form, content, and conventions. Students will brainstorm several "hot issues" and select one. Students will research that one issue and itemize the various aspects of that issue. Students will select one aspect of the chosen issue to become the subject of the argument essay. Working in small groups students will develop questions based on one aspect of the issue based on their research. As a class, students will select six to ten questions to ask interviewee about the subject. Students will record interviews with six people, querying them about the issue. The interview will be recorded. Based on the recorded interviews and library research, the draft essay will conform to the argument form analyzed by the class. Peer editing (either in class or by X between peer editor and writer) will carry the writing process to its conclusion, i.e., a balanced argument essay containing information, facts, and opinions gathered through the student's research efforts and interviews. Students will prepare an executive summary to present to the class. Positions vis a vis the issue will most likely differ based on any number of factors including, but not restricted to, nature and quality of research and interviewee's responses. Students will gain insight into the complex nature of an issue-based argument, and, hopefully move away from accepting simplistic solutions for complex problems.

C. Assessment:

Evaluation of process and final essay

5. Instructor Resources/References:

Troyka's Handbook for Writers, 3rd ed.
The Bedford Reader, 5th ed.
Library and on-line research
CD ROM indexes and mass media publications
Instructor created timeline for project completion

6. Integration of Technical/Academic Courses:

This activity blends the argument essay form with effective speaking and listening skills in designing and implementing a plan of action, using tools of technology found in the workplace, and gives a hands-on experience with divergence of opinion and tolerance in problem solving.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
# C-29

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** English
All technical areas

3. **Topic/Competency/Goal:** Introduction to technical writing in the workplace will help learners realize that technical writing is done in a variety of settings. Students will be able to communicate clearly as they accomplish writing tasks.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Books
Pen
Paper
Dictionary
Newspapers
Magazines
Manuals
Computers

2. Preparation for Activity/Prerequisite

Pre-test on technical writing terms

B. Description of Integrated Learning Activity:

Student will be introduced to technical writing specifically the characteristics of accuracy, clarity, completeness, conciseness, organization, and correctness. They will study models of various forms of technical writing including sales letters, reports, memos, proposals, description, instruction, and training materials.

C. Assessment:

Selection of a technical form of writing and demonstrating effective characteristics

5. Instructor Resources/References:

Forlini's Grammar and Composition
Troyka's Handbook for Writers, 3rd ed.

6. Integration of Technical/Academic Courses:

Skills of technical writing will be integrated with content of technical courses in producing sales letters, reports, memos, proposals, descriptions, and training materials.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#__C-30__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** Office skills and all technical fields

3. **Topic/Competency/Goal:** Students will engage in activities to prepare for an effective job interview.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Copy of Most Common Interview Questions (attached)

      2. **Preparation for Activity/Prerequisite**

         Student selection and research of company or career field for job interview

B. Description of Integrated Learning Activity:

Student will work with associate from Chamber of Commerce, Economic Development Council, or other business group to participate in a job interview. Students will research to prepare questions for an interview with a business/industry person about the job application/interview process in that career field and in so doing will then be prepared for a mock interview by that business person for a job with a particular company.

C. Assessment:

Interview conducted with business person and mock job interview by student

5. Instructor Resources/References:

John Kushner, How to Find and Apply for a Job, South-Western Publishing
Truman Jackson's Letter of Application & Resume, South-Western Publishing
McCabe & McCabe, The Job Hunting Handbook, South-Western Publishing
Troyka's Handbook for Writers, 3rd ed.
Resume Handouts, examples attached

6. **Integration of Technical/Academic Courses:**

Students will use research, critical thinking, and effective presentation skills in preparing to interview and be interviewed for a job in a particular career field.

7. **Developed by:** **Date Developed/Revised: December 1995**

Janet Cook
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The Most Common Interview Questions

1. Tell me about yourself?
2. How did you learn about this job?
3. Why are you interested in joining our organization?
4. What makes your believe that you are qualified for the job?
5. What do you see yourself doing five years from now? Ten years?
6. What are your long range career goals?
7. How do you plan to achieve your career goals?
8. Tell me about your education and training?
9. Do you smoke?
10. Tell me about jobs you have had?
11. Which job duties did you like best?
12. Which job duties did you like least?
13. Why should I hire you?
14. What are your three greatest strengths for this job?
15. What are your three greatest limitations for this job?
16. What kind of people do you like to work with?
17. What machines or equipment can you operate?
18. Why have you changed jobs so many times?
19. Why have you been out of work so long?
20. Why did you leave your previous jobs?
21. What salary do you have in mind?
22. When would you be able to start work if you are hired?
23. How do you handle pressure?
24. Why do you think people succeed? Fail?
25. What did you do on your last job? Tell me about your day?
26. In one word, how do you describe yourself or in one word how would your past employer describe you?

27. What do you know about our company?

28. Are you willing to relocate?

29. Are you willing to travel?

30. What have you learned from your mistakes?

31. In what ways do you think you can make a contribution to our company?

THE FOLLOWING ARE SUBJECTS TO BE WARY OF IN THE JOB INTERVIEW:

Your age

Your marital status

Your sexual preference or personal habits

Your children (How many, ages, names)

If you are pregnant

Your credit history, amount of credit, current credit status

Any pending lawsuits

Your religion

If you have ever filed for bankruptcy

Your mental/medical history

If you have every filed for Worker's Compensation

INTERVIEW TIPS

The employment interview is your opportunity to communicate. In addition to being verbal, you will communicate in many other ways. Everything you do, all your movements, will add up to "body language." Make your body and all your actions say positive things for you.

1. Go alone. Arrive ten minutes early, no more. NEVER arrive late!
2. Personal appearance and body language are VERY IMPORTANT. Sit up straight, don't cross your arms in front of you. Don't fidget, tap your feet, bite your nails, or click your pen. Don't chew gum or smoke.
3. Greet the interviewer with a firm handshake, if the interviewer extends his or her hand. (don't be a wimp or try to be like Arnold Swartzenegger)
4. During the interview, let the interviewer ask the questions. When the interviewer is finished, then you may ask any questions you may have.
5. Avoid one word answers. Do not answer "yeah" or "nope". Answer questions completely, but avoid too much talking.
6. Relax, smile and be yourself. Nothing will impress the interviewer more than spontaneity and sincere interest.
7. Maintain eye contact.
8. Express enthusiasm and interest in the job. Sell yourself whenever you get the chance. Be POSITIVE.
9. ASK to be considered for the job if you really want it.
10. Thank the interviewer for his/her time.
11. Shake hands.

QUESTIONS EMPLOYERS CANNOT ASK YOU!

1. Your sex, marital status, living with anyone, divorced or separated, when a divorce will be final, etc.
2. Children, how many, how old, who cares for them, do you plan to have anymore.
3. Physical information such as height, weight, handicaps, etc. (unless necessary for job in question)
4. If you've ever been arrested, jailed or convicted of a crime(unless security clearance is a requirement)
5. If in the military, what branch you are in, or if you received an honorable discharge.
6. Any reference to age other than "are you over 18?"
7. Do you own a home, rent, live in an apartment, etc.

PRE-INTERVIEW CHECKLIST

__________ATTITUDE--am I thinking POSITIVE & WINNER?

__________OUTFIT--is it appropriate, pressed and clean?

__________TOUCH-UP MAKEUP, COMB, BRUSH?

__________ BODY SCENT--do I smell gooood?

__________HAIR--clean and combed?

__________HANDS--clean hands and nails?

__________BREATH--would I pass the breath test??

__________MASTER APPLICATION--neat and complete?

__________LIST OF TOUGH QUESTIONS, RESUME?

__________BLACK PENS?

__________TIME--enough to be early?

Integrated Curriculum Activity
#__C-31__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:** Office Skills
Computer
All technical fields

3. **Topic/Competency/Goal:** Students will engage in activities to write an effective resume.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Paper
Pens
Word processing software
Models of effective resumes

2. Preparation for Activity/Prerequisite

Study of resume format and required information

B. Description of Integrated Learning Activity:

Students will research a career or technical field for possible future employment. Students will prepare an effective resume for that career field and in so doing will identify personal strengths and abilities that would make the student a desirable candidate for a job with that particular company.

C. Assessment:

Completed resume

5. Instructor Resources/References:

David Eyler's, Resumes That Mean Business, Random House
Truman Jackson's Letter of Application & Resume, South-Western Publishing
McCabe & McCabe, Writing Effective Resumes, South-Western Publishing
Troyka's Handbook for Writers, 3rd ed.
Resume Handouts, examples attached

6. Integration of Technical/Academic Courses:

Students will use research, critical thinking, and effective presentation skills in preparing resume for a particular career field.

7. Developed by: **Date Developed/Revised: December 1995**

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JANE C. SCHOOL
400 Simpson Road
Winter Haven, Florida 32755
(407) 678-9123

CAREER OBJECTIVE: To obtain long term employment with growth potential with a company where I can contribute my Culinary Art skills and abilities and my positive attitude for a successful future.

McDonald's Restaurant
1200 East State Road 434
Winter Springs, Florida 32708
(407) 365-5700
John Callahan - Manager

Crew Member
-opened and closed restaurant
-maintained Milkshake Machine
-responsible for all food preparation
-operated computerized cash register
-offered management training position

American Clubhouse Grill #1
10750 Atlantic Blvd.
Jacksonville, Florida 32216
(904) 928-9940
Sugar Ray - Kitchen Manager

Speciality Cook
-prepared garnishes for sandwich plates
-maintained fryers
-measured and mixed ingredients according to recipe.
-occassionally served orders to customers
-selected for special presentation of Relish Trays

Olive Garden Restaurant
665 N. Orlando Avenue
Winter Park, Florida 32789
(407) 740-7117
Dave Saylor - Manager

Speciality Cook
-prepared takeout orders
-trained new pasta makers
-trained take-out and delivery drivers
-served food to waiters on time
-prepared appetizers, relishes and garnishes
-floor coach

EDUCATION:

-Lake Howell High School
-St. Augustine Technical Center
-Technical Education Center of Osceola

ACTIVITIES:

-Future Business Leaders of America
-Future Homemakers of America
-American Culinary Federation, Junior Member
-VICA (Vocational Industrial Clubs of America)

REFERENCES AVAILABLE UPON REQUEST

RESUME ROUGH DRAFT FORM

Name: ______________________________
Address: ______________________________
Phone Number: ______________________________

Career Objective: ______________________________
____

Work History:

Name/Address/Dates/To/From Responsibilities
____
____
____

Name/Address/Dates/To/From Responsibilities
____
____
____

Name/Address/Dates/To/From Responsibilities
____
____
____

Education/Training:

Name/City/Degree ______________________________
____
____
____
____

References furnished upon request.

RESUME

A Resume is your personal advertisement to a prospective employer. It communicates your strengths and abilities, highlights your accomplishments, and provides a summary of your achievements. It sells your qualifications and your potential. Your resume is also a direct **MARKETING TOOL.** The **MAIN PURPOSE** of the resume is to get an **INTERVIEW.** A resume is a reflection of you, your personality, creativity and ability to express yourself. You need to focus on what you can contribute to the company. A resume is designed to speak to and focus on the needs of a particularly employer. It is composed and designed with someone or some purpose in mind.

WHAT MAKES AN EFFECTIVE RESUME?

An effective resume is **persuasive or convincing.** It captures an employer's attention and brings you immediate recognition. Your resume sends a powerful message that will greatly influence your success in the job market. The single most important elements of any resume is **visual presentation.** Your resume must capture the employer's attention.
As large companies receive thousands of resumes a year, it is easy to understand why many go in the garbage within hours of the time they are delivered by the mailman. Therefore, it is important to create a document that provides the necessary information with which the employer can make a decision.

RESUME DO'S

1. "Hook" your readers - include key points about yourself that will make the reader want to find out more.

2. Highlight your strengths - concise summary of your best "selling points".

3. Structure your resume like a pyramid - most important things should be near the top. Always start with your best features.

4. Be sure your resume is easy to read - (Keep It Simple & Short)

5. Keep your sentences short - use action words.

6. Help your readers know what to read - use "bullets", dashes.

7. Support your objective - make sure your resume shows clearly why you are qualified for the job you are seeking.

8. Keep your resume to one page.

9. Answer the question that every employer asks - "What can this person do for me?" If your resume can answer that question, you can get an interview - and an interview can land you a job.

10. It should be typewritten with NO mistakes.

11. Use only good quality white or ivory paper and matching envelope.

12. Be accurate - ALWAYS tell the truth on a resume

13. Be confident accentuating all your abilities, qualifications, and accomplishments.

14. Your ability to communicate on paper will directly affect your chance of career success.

RESUME DON'TS

1. Don't lie - Don't stretch the truth
2. Don't copy someone else's resume
3. Don't write long sentences
4. Don't use long lines
5. Don't put more than four lines together in one "block."
6. Don't be vague
7. Don't include information that is not relevant to an employer
8. Don't include "personal" information
9. Don't list a reference unless you have the person's permission.
10. Don't build your resume around dates.

PARTS OF A RESUME

Your resume's look and content will vary, depending on your goal. Whether you are trying to land your first job or make a career change, you can create and style your resume around your unique credentials.

Objective - statement of intent. There are two types:

1. Targeted - identifies a specific position you want
2. Generic - identifies generally (in sentence form) the type of position you desire within a particular field.

Summary Statement - When you have five or more years of experience in a particularly field or industry. Used as an alternative to the objective. It portrays, in sentence form an overview of your credentials.

Qualifications - highlight and summarizes your areas of expertise. It tells the employer what skills you have to offer. There are two ways to present your qualifications.

1. Short Form - Four to six main areas of expertise. You highlight your strengths and identify your abilities by presenting them in a concise list.
   (Purchasing, Marketing, Testing, Accounts Payable)

2. Long Form - Six to eight main areas of expertise in an expanded format. Focus on specific skills and/or knowledge you possess.

   (Human Services - Patient Relations; quality patient care;
   Awareness of Community Services; agency referrals;
   Evaluation Techniques; specialized assessment methods)

Professional Experience - summarizes your employment history. It tells the employer the following information:

Places of employment	Job titles
Date of employment	Responsibilities

Education - outlines your training and schooling. Such as: degrees, certificates, continuing education, including professional workshops a- seminars.

References - are always provided upon request. They should not be listed on your resume. Your references represent professional, personal, and/or academic contacts.

ACTION WORDS

Developed
Advised
Analyzed
Operated
Suggested
Produced
Supervised
Built
Assisted
Documented
Researched
Formulated
Merged
Investigated
Budgeted
Interpreted
Obtained
Was in Charge of

Initiated
Authored
Designed
Explained
Complied
Revised
Instructed
Modified
Negotiated
Provided
Edited
Enlarged
Administered
Taught
Cultivated
Formulated
Instituted

Coordinated
Performed
Maintained
Reviewed
Generated
Created
Planned
Wrote
Evaluated
Persuaded
Accomplished
Motivated
Established
Coached
Tested
Merged
Diagnosed
Was responsible for

Controlled
Implemented
Recommended
Monitored
Adjusted
Adapted
Enhanced
Reported
Trained
Augmented
Reorganized
Consolidated
Conducted
Counseled
Steered
Won
Took part in

Integrated Curriculum Activity
#__C-32__

1. **Discipline/Course Unit:** Freshman Composition I

2. **Related Disciplines:**
Office Skills
Computer and Word Processing Skills
All technical areas

3. **Topic/Competency/Goal:** Upon completion of this component the student should be able to read a Want Ad, understand the different types of Want Ads, put together a cover letter and type a final draft utilizing current technology.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Classified section of the Orlando Sentinel
Paper
Pencils
Word Processing Equipment

2. Preparation for Activity/Prerequisite

Research the classified ad section, plan and write a cover letter.

B. **Description of Integrated Learning Activity:**

To have students, research, plan, write and proofread their cover letter for employment.

C. **Assessment:**

5. **Instructor Resources/References:**

Sunday Orlando Sentinel Classified Section

Dynamite Cover Letters, Ronald Krannich & Caryl Rae Krannich, Impact Publications

How to Find and Apply for a Job, John Kushner, Southwestern Educational Publishing

Want Ads Handout, "Tips for Building a Successful Cover Letter" Handout, and Cover Letter Checklist

6. Integration of Technical/Academic Courses:

Data must be obtained through research of the classified ad section by the students. The project will emphasize a real-life situation.

7. Developed by: **Date Developed/Revised: December 1995**

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WANT ADS

There are three types of want ads. The first type is a regular want ad which is where you apply to a specific company. The second type is a blind box ad which is where you apply to a Ad# 0000 or to a P.O. Box with no company name mentioned in the ad. The third type is a phone/fax want ad which is when you fax your resume and cover letter. Listed below are examples of the three types of ads.

Regular Want Ad:	Bookkeeper/Paraprofessional For West Orlando CPA firm. Exp'd in computerized acctg systems. Send resume and salary req to: Harold Keene CPA, 826 N. John St, Ste 103, Orlando, Fl 32808.
Blind Box Want Ad:	Accounting Assisant Local contractor seeking exp'd Acctg. Assit. A/P exp a must. Good input skills. Must be organized. Excellent pay & benefits. Send resume to: Reply Orlando Sentinel Ad #2099.
Phone/Fax Want Ad:	Attendance Statistician Must be good with numbers, detail-oriented, familiar with computer spreadsheets. Must work weekends. FAX resume to Water Mania at 407-396-8125 ATTN: Gary

Cover Letter Checklist

Use this checklist to critique your cover letters. If you can answer "yes" to every question, you have an excellent cover letter.

1. Is your cover letter addressed to a specific person? (Are you sure that this is the correct person and that you have spelled the name and the title correctly?)

2. Does the letter state clearly why you are writing?

3. Does the letter tell the employer why you are qualified for the position you are applying for? Provide examples of your qualifications.

4, Does the letter tell what you can contribute to the organization?

5. Make sure your letter highlights the most relevant facts about you and your background?

6. Does your letter use "action words" to describe your skills, accomplishments, and qualifications.

7. Does your letter respond directly to the job description? If so, does it address each of the points mentioned in the job description.

8. Make sure your letter does not include "jargon" that might not be understood by the recipient?

9. Is your letter persuasive?

10. Does your letter avoid negative statements and apologies?

11. Have you cut out things that seem vague or insincere?

12. Are the paragraphs short (no more than five lines each)?

13. Does your letter fit neatly onto one page?

14. Is your letter well typed and presented?

15. Does your letter include your name, address, and phone number?

16. Does your letter ask for an interview?

TIPS FOR BUILDING A SUCCESSFUL COVER LETTER

1. The purpose of a cover letter is to get an employer to read your resume, a copy of which accompanies the letter and to get you an interview..

2. Your goal is to give your reader enough information to interest him or her in looking at your resume, but not so much that the reader is overwhelmed.

3. It is best to address your letter to a person, so always research the company you are applying to and find out the name of an individual to write to.

4. Include your address and phone number and the date.

5. In your first paragraph tell your contact what you want and how you know about his/her organization. If you have been referred, be sure to name your referent in your first paragraph. Keep it simple.

6. In your second paragraph give a concise overview of your work history and the skills you have that will help you perform the job. Give only information about your qualifications that are related to the job for which your are applying.

7. In your third paragraph state your confidence in your abilities and ask for an interview, give information on how you can be contacted.

8. In closing your letter use a businesslike closing to the letter. A good closing would be Sincerely or Yours truly.

9. Be sure to sign your letter and type your name beneath your signature.

10. Alert your reader to the fact that another document - your resume accompanies your letter.

11. Be sure to proofread your cover letter. Mistakes are not acceptable.

12. Handle the letter carefully to avoid a dirty appearance.

COVER LETTER WORKSHEET

This page shows how to write a cover letter. A cover letter persuades the employer to consider you for employment. The letter should be brief and factual. Use this worksheet as a guide.

Date:	____________________________Month, Day, Year
Sent to:	____________________________Name ____________________________Title ____________________________Company Name ____________________________Address ____________________________City, State, and Zip Code
Greeting:	Dear ______________________:
Self introduction:	Begin with a statement about who you are.
Statement of purpose:	Why you are writing this letter?
Message (the "hook"):	Show the employer that you are the best candidate for the job! Be warm and friendly. Refer to your past experiences that show that you are qualified for this job. Let the employer know that you have done your homework and know something about the job and the company.
Concluding statement:	Include a final remark on why you would be the best candidate for the job and request to hear from the employer as soon as possible.
Closing phrase:	Use a formal ending, such as "Yours Truly" or "Sincerely."
Signature:	Use your best penmanship to sign your name. Print or type out your name beneath the signature.

Mathematics

Integrated Curriculum Activity
M-1

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Surveying, Drafting

3. **Topic/Competency/Goal:**

   a. The student will perform appropriate algebraic operations to solve equations.
   b. The student will calculate distances using the Pythagorean theorem.
   c. The student will write the equation of a line using the slope and a point.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         a. Blank paper
         b. Graph paper
         c. 3-4 tape measures at least 25 foot long
         d. Rulers
         e. Stopwatch

      2. **Preparation for Activity/Prerequisite**

         a. Review basic operations of graphing.
         b. Review the form for linear equations.
         c. Review the methods for using the Pythagorean theorem.
         d. Review the methods for solving a linear equation.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

The instructor should prepare by setting up one long tape measure to act as the straight line distance which the students will line their paper airplane flights up by. Other tape measures need to be available to measure the actual distance and the deviation distance from the straight line. (The actual distance will be the Hypotenuse of the right triangle formed by the three measurements.)

The students should be assigned ahead of time the task of designing and building a paper airplane which will fly as straight and as far as possible. Have the students fly their planes and record the information for problems 1 through 5 on their data sheets. Following their flights, students should read and follow the instructions on their data sheets to complete the exercise. They will be constructing a scale drawing representing the data associated with their plane's flight.

An extension of this exercise could include having students do multiple flights and plotting the multiple landing positions on their drawings. The students could then find a "line of best fit" for the data they have collected and make predictions about future flights.

ALGEBRA AIRPLANE PROJECT

Data Collection Sheet

Design a paper airplane which will travel as far and straight as possible. Record the following information about your flight.

1. Flight time in seconds. (round to 1 decimal point.) _________

2. Straight line distance. (round to nearest half-foot)__________

3. Actual distance from start to plane. (round to nearest half-foot) ____________

4. Measured deviation distance (distance from straight line to plane). (round to nearest half-foot) ________

5. Did your plane land to the right or left of the line? ___________

6. Title your graph paper "Airplane Lab". (see attachment for example)

7. At the bottom center of your graph paper mark a starting point. Label this point X.

8. Draw a vertical line from the starting point X just under the title.

4. Integrated Learning Activity (continued):

9. Draw a horizontal line touching the bottom of the vertical line on your paper.

10. Record a scale for your graph (maybe each block = 6"). For the bottom scale, the X is the zero point, and mark each direction positive from zero.

11. Mark a point on the vertical line corresponding to your plane's straight distance. Label this point Y.

12. From point Y, move over horizontally the number of feet and the direction your plane deviated from the straight line. Label this point Z.

13. Draw a line from Z to X, forming a triangle.

14. Label the line between X and Y "A."

15. Label the line between Y and Z "B."

16. Label the line between Z and X "C."

17. Determine the length of line "C" using the Pythagorean Theorem: $a^2 + b^2 = c^2$.

18. What was the actual distanced which you **measured** from the flight?

19. What was the actual distance you **calculated** from number 17?

20. Compare the two amounts from 18 and 19. How far off were your calculations?

21. What percent error is the difference?(difference divided by actual amount and convert to percent)

22. What are some reasons why your measured distance and your calculated distance are different?

23. Use the distance formula (D=RT) and the data you collected to calculate the speed of your airplane's flight in feet/second.

24. Convert #23 to miles per hour.

4. Integrated Learning Activity (continued):

25. We found the actual distance traveled by your plane by measuring it and by using the Pythagorean Theorem. Can you think of a way to use your scale drawing as a third way of finding the actual distance your plane traveled?

26. What would be a benefit of using more than one method to calculate the same value?

EXTENSION

27. Conduct at least 3 more flights of your plane and record their landing positions as points on your scale drawing.

28. Draw a line on your scale drawing which best represents the position of the points. This is called a "line of best fit."

29. Find the slope of the line.

30. Find the equation of your line of best fit. (Hint: Try using the slope and any point in the formula $y - y_1 = m(x - x_1)$.)

31. Use your linear equation to predict the following: How far away from the straight line (deviation distance) would your plane be if the straight line distance traveled was 100 feet?

C. Assessment:

This assignment may be assessed by observing the students during the data collection process and critiquing their measurements and direction following skills (either verbally or in writing). The data collection worksheets may be collected and graded for accuracy. Finally, students may be asked to make a journal entry to describe what they feel they gained from this activity.

5. Instructor Resources/References:

a. TI-82 manual (or other calculator manual)
b. TI-Graph Link manual
c. Intermediate Algebra text
d. *Hormones and Your Heart*, **Prevention**, May 1995, p. 70-78

6. Integration of Technical/Academic Courses:

Technical courses are integrated through the use of scale drawings, data collection and organization, and in certain scientific procedures such as finding percent error and in the prediction of future results based on the analysis of data.

7. Developed by:	**Date Developed/Revised:**
Melissa Pedone	December, 1995

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Orange County Public Schools • Osceola District Schools • Valencia Community College

Integrated Curriculum Activity

# M-2

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Geometry, Engineering Technology

3. **Topic/Competency/Goal:**

   a. The student will perform appropriate measurements.
   b. The student will use appropriate conversion factors and formulas in solving problems.
   c. The student will write and graph linear relations.

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   a. Multiple speed bicycle
   b. Paper
   c. Calculator
   d. Calipers (optional)

   2. Preparation for Activity/Prerequisite

   a. Review the concept of ratio.
   b. Review geometric formulas relating to circles..
   c. Review conversion factors for length and time.
   d. Review the form for linear functions.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

In this activity, the student will measure the diameter of each sprocket of a multiple speed bicycle. (If the sprockets cannot be measured, then the teeth will be counted instead.) The ratios of each front to back sprocket combination will be calculated and associated with the appropriate gears. using a fixed number of turns for the front sprocket, the number of revolutions of the rear wheel will be calculated for selected gears.

ANALYZING BICYCLE GEAR RATIOS

1. Calculate the ratio of each combination of front to back sprocket. For example, on a 27" 10-speed bicycle with 50 teeth and 40 teeth in the two front sprockets, and 5 rear sprockets with 28, 24, 20, 18, and 14 teeth respectively, the ratio of the front sprocket with 50 teeth to the back sprocket with 20 teeth would have a ratio of 50:20 or 5:2.

Make a list of sprocket combinations and ratios.

2. For each of the ratios found in 1, calculate the number of times the rear wheel will turn if the front wheel is turned 60 times in a minute. As an example, use the ratio of 5:2 from the previous example. If the front sprocket is turned 60 times, the rear sprocket must turn 150 times ($\frac{5}{2} \times 60 = 150$) Note: This is an inverse relation. List your data in a chart.

3. Calculate the distance traveled by the bicycle when one of the rear sprockets completes one revolution. You will need the diameter of the wheel and the formula $C = \pi D$. Report your answer in inches and then convert to feet.

4. Use the results from 2 and 3 to find the distance traveled in one minute for each combination of gears. To find the distance traveled with the 5:2 ratio, you should use the 150 revolutions/minute calculated earlier. The circumference of a 27" wheel is 27π inches or $\frac{27\pi}{12}$ feet. Multiplying the number of times the wheel revolves by the circumference, $150 \frac{\text{rev}}{\text{min}} \times \frac{27\pi}{12}$ feet, will give you $1060.29 \frac{\text{feet}}{\text{min}}$. List your data in a chart.

5. Convert each of your measurements in 4 to $\frac{\text{miles}}{\text{hour}}$ using the conversion factors, 1 mile = 5280 feet and 60 minutes = 1 hour.

4. Integrated Learning Activity (continued):

6. Make a chart of gear ratio and speed in mph. Graph the gear ratio on the horizontal axis and the speed along the vertical axis. What type of graph does it appear to be? Write an equation for the data.

Extension

Using a bicycle with an odometer, compare the calculated speed with the actual speed as given on the odometer for several of the gear ratios.

C. Assessment:

This activity may be assessed by collecting the handouts and grading them for accuracy or by having the student write a summary of the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. Intermediate algebra text

6. Integration of Technical/Academic Courses:

This activity relates topics in algebra and geometry to engineering topics.

7. Developed by:	**Date Developed/Revised:**
Tim Williams	December, 1995

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Integrated Curriculum Activity
M-3

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Physics, Electronics

3. **Topic/Competency/Goal:**

   a. The student will solve common logarithmic equations when working with small and large signal amplifiers.

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   a. Calculator
   b. Paper

   2. Preparation for Activity/Prerequisite

   a. Review finding logarithms and antilogarithms with a calculator.
   b. Review the methods for solving logarithmic equations.

   B. Description of Integrated Learning Activity:

We will be solving for **power gain and voltage gain** in small and large amplifiers using methods used in solving general logarithmic equations.

4. Integrated Learning Activity (continued):

APPLYING COMMON LOGARITHMIC EQUATIONS IN ELECTRONICS

A parameter of many electronic circuits or systems is **gain**. The symbol for **gain** is **A** and is the ratio of an output quantity to an input quantity. Gain is the ability of an electrical circuit to increase the level of a signal. it is the comparison of the signal fed into the amplifier with the signal coming out of the amplifier. A device may be analyzed in terms of **power gain** (A_p), **voltage gain** (A_v), **current gain** (A_i), or **resistance gain** (A_r). We will concentrate on the power gain and the voltage gain. In AC circuits, gain will vary as frequency varies. Voltage gain is used to describe the operation of small-signal amplifiers and power gain is used to describe the operation of large signal amplifiers. The equations to be used are:

1) $A_p = 10 \log \frac{P_{out}}{P_{in}}$ (Power gain formula)

where P_{out} and P_{in} are given in watts (W) and A_p is given in decibels

2) $A_v = 20 \log \frac{V_{out}}{V_{in}}$

where V_{out} and V_{in} are given in volts and A_v is given in decibels

Work the following problems using the formulas above.

1. The power out of an amplifier is 30 W. The input power is 100 mW. What is the power gain in decibels?

2. The power gain of a power amplifier is 40 dB. If the input power is 50 μW, what is the output power?

3. The output voltage of an amplifier is 1.73V. The input voltage is 50μV. Find the voltage gain in dB.

4. The voltage gain of a device is – 6 dB. If the output voltage is 700 mV, find the input voltage.

4. Integrated Learning Activity (continued):

C. Assessment:

This assignment may be assessed by collecting the worksheets and grading for accuracy. A test could be given using the formulas presented. Sample questions could be:

1. $V_{in} = 50\ \mu V$ $V_{out} = 1\ V$. Find A_V (dB).
2. $P_{in} = 20\ mW$ $P_{out} = 35W$ Find A_P (dB).
3. $A_P = 25\ dB$ $P_{out} = 15W$ Find P_{in}.
4. $A_P = -3\ dB$ $P_{out} = 1W$ Find P_{in}.
5. $A_V = 75\ dB$ $V_{in} = 2\ mV$ Find V_{out}.
6. $A_V = 60\ dB$ $V_{out} = 3\ V$ Find V_{in}.
7. $A_P = 38\ dB$ $P_{in} = 5\ mW$ Find P_{out}.
8. $A_V = -10\ dB$ $V_{in} = 2.7\ mV$ Find V_{out}.

5. Instructor Resources/References:

a. *Electronics Math* by Deem
b. *Electronics-Principles and Applications* by Schuler

6. Integration of Technical/Academic Courses:

The topic of logarithms is developed in advanced algebra courses. Integration of algebra and electronics can be found in the calculation of power gain and voltage gain.

7. Developed by: Tinker Cooper

Date Developed/Revised: December, 1995

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Integrated Curriculum Activity
M-4

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Earth Science, Physics, Environmental Science

3. **Topic/Competency/Goal:**

a. The student will be able to write equivalent equations by taking the natural logarithm of both members of a given equation.
b. The student will be able to use a calculator to perform calculations involving real exponents.
c. The student will be able to calculate approximate values by using the $\ln x$, y^x or e^x keys on a scientific or graphing calculator.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Scientific or graphing calculator

2. Preparation for Activity/Prerequisite

a. Review basic operations of natural logarithms.
c. Review operations with the number e.

B. Description of Integrated Learning Activity

Math, and specifically, natural logarithms, are used to determine varying atmospheric pressure at a constant temperature. The pressure is measured in pascals (p), and is given by the following formula:

$p = 101.3\ e^{-0.001(h)}$ where h is the altitude in meters above sea level

The following worksheet provides problems for the students to work. The solutions are included.

4. Integrated Learning Activity (continued):

ATMOSPHERIC PRESSURE

At a constant temperature, the atmospheric pressure, p, measured in pascals, is given by the formula:

$p = 101.3\ e^{-0.001(h)}$ where h is the altitude in meters above sea level

1. Find the atmospheric pressure at the top of Mount McKinley with an elevation of 6194 meters.

2. Find the atmospheric pressure at sea level assuming an elevation of 0 meters.

3. What would the elevation be if the atmospheric pressure was one-half that at seal level?

4. Mount Everest (8848 meters) is approximately twice as tall as Mount Rainier (4392 meters) in Washington. How many times greater is Mount Rainier's atmospheric pressure than Mount Everest's?

5. How many times greater is the atmospheric pressure at Mount Saint Helens (2549 meters) than at sea level?

Solutions

1. $p = 101.3\ e^{-0.001(6194)}$
$p = 0.2068$ The pressure at the top of Mt. McKinley is .2068 pascals.

2. $p = 101.3\ e^{0}$
$p = 101.3$ The pressure at sea level is 101.3 pascals.

3. $\frac{1}{2}(101.3 \text{ pascals}) = 50.65 \text{ pascals}$

$50.65 = 101.3\ e^{-0.001(h)}$
$h = 693$ An elevation of 693 meters would have a pressure of one-half of he pressure at sea level.

4. Integrated Learning Activity (continued):

4. Mount Rainier

$p = 101.3\,e^{-0.001(4392)}$
$p = 1.25$

Mount Everest

$p = 101.3\,e^{-0.001(8848)}$
$p = 0.015$

$$\frac{1.25}{0.015} = 83.333$$

The atmospheric pressure is 83.333 times greater at Mount Rainier.

5. p(sea level)

$p = 101.3$

p(Mt. St. Helens)

$p = 101.3\,e^{-0.001(2549)}$
$p = 7.9$

$$\frac{101.3}{7.9} = 12.8$$

The pressure at sea level is 12.8 times greater than at the peak of Mount Saint Helens.

Extension

The students could graph the possible atmospheric pressures ranging from the highest elevation on earth (Mount Everest) to sea level. This would represent a real world example that also demonstrates a logarithmic graph. The students could research other sea levels and determine their atmospheric pressures.

C. Assessment:

The students should complete the worksheet. The students could turn in the extension as a brief report. A test question including the free fall formula should be included on a test of solving quadratic equations.

5. Instructor Resources/References:

a. *Prentice Hall Algebra 2*
b. *World Book Atlas*

6. Integration of Technical/Academic Courses:

This activity integrates earth science, physics, environmental science and mathematics through the use of calculation of pressure/elevation from an exponential equation.

7. Developed by:	**Date Developed/Revised:**
Kevin Kugler	December, 1995

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Integrated Curriculum Activity

M-5

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Business

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will examine and describe relationships between two variables expressed algebraically or graphically through the use of functions and functional notation.
c. The student will use the hand-held calculator to perform basic operations and to solve algebraic statements.
d. The student will analyze and solve verbal problems algebraically using linear equations containing one variable.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper or graphing calculator (e.g. TI-82)
b. LCD Overhead Panel for graphing calculator with overhead projector (optional)
c. TI-Graph Link with appropriate computer and printer (optional)

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing, point plotting for the graphing calculator.
b. Review the formulas for area and volume for rectangular solids.
c. Review methods for determining areas and volumes of irregular shapes.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

In Florida, many homes have pools. As a pool contractor plans a pool, he/she must consider the owner's wishes as well as the cost of materials. The students will act as contractors and will determine the quantity of surface material that will be needed to coat the inside of a pool. In addition, the volume of the pool will be calculated to determine the amount of water that will be needed for the initial filling. As alternative proposals for the owner, the students will develop a proposal that maintains a constant volume but alters the dimensions of the pool so that the cost of pool coating may be minimized.

BUILDING A POOL

I. Mr. and Mrs. Cortez have contacted the MAT Pool Builders to provide them with estimates on two possible pools. For the first pool, they would like to have a quote on building a rectangular pool that is 15 feet wide and 30 feet long. The depth should change uniformly from a shallow end of 4 feet to a deep end of 8 feet.

Calculations

1. Use graph paper to make a scale drawing of each side and the bottom of the pool. Determine all necessary dimensions to calculate the total surface area of the pool.

2. If a 0.5 inch coating of marcite is to be applied to the entire surface area, determine the total volume of marcite in cubic feet required.

3. Determine the total volume of the pool in cubic feet. (Hint: You may want to divide the pool into two different pieces to calculate volume. A scale drawing may help.)

4. If the pool will be filled to within 4 inches of the top, how much water in gallons will be needed?

II. For the second pool, the Cortez family would like to keep the same total volume of the first pool but would like to have a pool uniform in depth. They would still like the length to be twice as long as the pool is wide.

Calculations

1. If the pool is to be 3 foot deep, what would be the length and width of the pool? How much surface area would have to be coated with marcite?

4. Integrated Learning Activity (continued):

Calculations (cont.)

2. If the pool were to be 4 feet deep, what would be the length and width of the pool? How much surface area would have to be covered?

3. Repeat the calculations for a 5 foot deep pool.

Questions

1. Would each of the pools contain the same volume of water since they have the same total volume? Make a chart including the pool dimensions, the volume of each pool, and the volume of water needed to fill each pool to 4 inches from the top. Use the chart to answer the question.

2. Would each of the pools require the same volume of marcite to coat the pool?
Make a chart that would include the pool dimensions, the surface area of each pool and the volume of marcite required for a 0.5 inch coating.

Extensions

I. Since the cost of building the pool is dependent on the amount of marcite used, the larger the surface area the higher the cost of marcite. The owner's decide that they would like to have a pool with the volume of the first pool, but with the smallest amount of surface area possible. They decide that they want a pool of uniform depth with a length twice the size of the width. What would be the dimensions of this pool?

Calculations

1. Let the depth be d, the width be w and the length be 2w. Since you know what the total volume should be from part I, write an expression for volume and solve it for d.

2. Write a function for surface area, S(w) that includes all 4 sides and the bottom of the pool.

3. Graph the function from 2 on graph paper or with a graphing calculator. If you plot this by hand, be sure to plot enough points and connect them with a smooth curve. (Plot w along the horizontal axis and S along the vertical axis.) Consider the domain and range carefully.

4. Integrated Learning Activity (continued):

Extensions (continued)

4. Find the point on the graph where the surface area is a minimum. What is the value of w? What would be the length of the pool? How deep would the pool be? Does this pool contain the required volume? (Be sure to show the calculations.)

II. Contact a pool contractor to see what the costs of various pool coatings are (not including labor). Calculate the cost for coating the pools found in Parts I and II.

III. Use your water bill (or contact a local utility company) to calculate the cost of the initial filling of each of the pools.

C. Assessment:

Students should complete the activity. In addition, a written proposal for each of the pools in Part I and Part II should be prepared for the owners. Included should be the dimensions of the pool, the volume of the pool, the volume of water needed, the surface area of the pool and the volume of coating required.

5. Instructor Resources/References:

a. TI-82 manual (or other calculator manual)
b. TI-Graph Link manual
c. Intermediate Algebra text

6. Integration of Technical/Academic Courses:

This topic integrates health, biology, and business with mathematics. Predictions are necessary to see whether medications are effective while insurance companies need models to set life insurance rates.

7. Developed by:	**Date Developed/Revised:**
Judith M. Jones	December, 1995

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Integrated Curriculum Activity
M-6

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Health, Biology, Chemistry

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will examine and describe relationships between two variables expressed algebraically or graphically through the use of functions and functional notation.
c. The student will use the hand-held calculator to perform basic operations and to solve algebraic statements.
d. The student will analyze and solve verbal problems algebraically using linear equations containing one variable.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper or graphing calculator (e.g. TI-82)
b. LCD Overhead Panel for graphing calculator with overhead projector (optional)
c. TI-Graph Link with appropriate computer and printer (optional)
d. References indicating dosage for drug administration

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing, point plotting for the graphing calculator.
b. Review the form for linear expressions and equations.
c. Review the methods for solving direct proportions.
d. Review conversion factors in the metric system between the metric and English systems of measurement.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

The size of a dose of prescription drugs is often determined by the weight of the patient. Medical personnel are often required to prepare a dose of medication for a patient using a more concentrated form of the drug.

CALCULATING THE REQUIRED DOSAGE OF DRUGS

I. You are in charge of checking the medications on a pediatric hospital ward prior to administration by the nursing staff. The following patients are to receive medication. Pediatric medications are often based on weight of drug per unit of body weight per unit of time. For example, if the dosage of a drug is listed as 20mg/kg/day, then a child should receive a total of 20 milligrams of the drug for every kilogram that he weighs each day. If the dose is to be given more than once a day, the total dosage must be divided.

Questions

1. Peter is to receive streptomycin sulfate, 30mg/kg/day, every 12 hours. Peter weighs 33 pounds. How much should Peter receive daily? How much should he receive in each dose? To find the answers, work the following problems.

a. Find the ratio needed to convert Peter's weight from pounds to kilograms. Set up a proportion to calculate Peter's weight in kilograms.

b. Use the dosage as a ratio to calculate the total weight of the drug to administer to Peter each day.

c. Divide the total dosage by the number of doses to be administered each day to find the weight of the drug in milligrams to administer to Peter every 12 hours.

2. The drug that Peter is to receive is available only in 1 gram vials that must be diluted to produce a liquid that contains 1 gram of streptomycin sulfate in every 3 milliliters of solution. What volume of medication should be administered every 12 hours.

a. Using the answer to question 1c, set up a proportion and solve it to determine the weight in grams to be administered every 12 hours.

b. Write the diluted drug information in Question 2 as a ratio. Now write a proportion using this ratio and the calculation from 2a to find the volume of the diluted medication to administer every 12 hours.

4. Integrated Learning Activity (continued):

3. Using the guidelines in Questions 1 and 2, find the dosage that should be given to Emily. Emily weighs 15 kg. Her doctor has requested that she receive 6mg/kg/day of Dilantin. She is to receive the medication every 8 hours. How much should the nurse administer every 8 hours?

4. Sarah is to receive neomycin sulfate 4 times a day. She weighs 44 pounds and she is to receive 50mg/kg/day. The drug is packaged a liquid containing 125mg of neomycin sulfate in 5 ml of solution. How many milliliters should Sarah's mother give her at each dose? How many teaspoons?

II. In addition to drugs dosages being calculated by weight of drug/body weight/unit of time, there are several other methods including the use of body surface area, Fried's Rule, Clark's Rule or Young's Rule. Fried's Rule, Clark's Rule and Young's Rule can be expressed as a linear function for each different type of drug used.

Fried's Rule is based on the age of the child and is usually used only for children under one year of age. Fried's Rule:

$$\text{Child's Dose (D)} = \left(\frac{\text{Average adult dose}}{\text{150 months}}\right)(\text{Child's Age(a) in months}).$$

Questions

5. Write a linear function D(a), for dosages of **ipecac syrup**, if the average adult dose is 30 ml.

a. What is the independent variable? What are the units to be used?

b. What is the dependent variable? What are the units to be used?

c. What is the slope of the line produced by this function? what are the units?

d. Write the function.

6. Graph the function from question 5 on graph paper or with a graphing calculator for the child's age from 1-12 months and then answer the following questions. If you use a graphing calculator, sketch the graph indicating the size of the window.

a. How many milliliters of ipecac should be given to baby Andrew who is 6 months old?

b. How many milliliters should be given to 11 month old, Juan.

4. Integrated Learning Activity (continued):

6c. How old would a baby be if she received 1.5 milliliters of ipecac?

III. Clark's Rule is based on the weight of a child and is used for children over 2 years old. For younger children, the possibility of a less accurate dose is greater. The equation that can be written for Clark's Rule is:

$$\text{Child's Dose (D)} = \left(\frac{\text{average adult dose}}{\text{150 pounds}}\right)(\text{Child's weight (w) in pounds})$$

Questions

7. Write a linear function D(w) for ampicillin if the average adult dose of ampicillin is 1 gram.
a. What is the independent variable? What are the units to be used?

b. What is the dependent variable? What are the units to be used?

c. What is the slope of the line produced by this function? What are the units?

d. Write the function.

8. Graph the function from Question 7 on graph paper or with a graphing calculator for children from 30 pounds to 75 pounds. If you use a graphing calculator, be sure to sketch your graph indicating the window used. Answer the following questions based on your graph.
a. How much ampicillin should be injected if Michelle weighs 45 pounds?

b. T.J. weighs 30 pounds. How much ampicillin should the doctor order to be injected?

c. Anne plans to inject 0.40 g into Sammy. How much should Sammy weigh?

Extension

Find Young's Rule is a reference text. Describe the rule and the conditions under which it is used. Write a linear function as you did for Clark's Rule and Fried's Rule. Graph the function and answer the following.

If the average adult dose of acetaminophen is 650 mg, determine the dosage for a 3 year-old, a 10 year-old and a 12 year-old child.

4. Integrated Learning Activity (continued):

C. Assessment:

Students should complete the activity for one type of assessment. At least one question requiring students to use ratio and proportion and linear modeling should be included on a test on this material.

5. Instructor Resources/References:

a. TI-82 manual (or other calculator manual)
b. TI-Graph Link manual
c. Intermediate Algebra text
d. Todd and Erickson, *Dosage Calculations Manual*, Second Edition, Springhouse Corporation, 1992.
e. Other dosage calculation texts

6. Integration of Technical/Academic Courses:

This activity directly relates drug dosage calculations from the health courses to algebraic calculations of proportion and linear functions.

7. Developed by:	**Date Developed/Revised:**
Judith M. Jones	December, 1995

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Integrated Curriculum Activity
M-7

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Health, Biology

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will solve and use exponential or logarithmic equations involving integer exponents only
c. The student will solve verbal problems which will require exponential or logarithmic equations for solutions.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper
b. Worksheet
c. Scientific calculator

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing, point plotting for the graphing calculator.
b. Review the form for exponential expressions and equations.
c. Review the methods for solving exponential equations using logarithms.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

In this activity, students are given an exponential equation which is used to determine the growth of the number of cells during cellular division. The students first complete example problems. Next, they complete a graphing assignment and are questioned on domain and range. Some extension questions are also included. This activity would be a good lead-in into exponential or logarithmic functions.

CELLULAR DIVISION

Biological organisms are made up of cells. These cells divide at a rate which is described by the formula:

$$y = 2^x$$

x = number of cellular divisions

y = number of cells

1. Use the above formula to complete the following problems.

a. How many cancer cells would be present in a culture after the original cell went through 8 divisions?

b. How many amoebas would be produced by a single one in a solution after 15 divisions?

c. A certain plant cell divides every four hours. How many plant cells would be present 48 hours after a single cell is placed in a culture?

d. A healthy tissue cell divides every 10 hours. After 100 hours, a single tissue cell has produced 128 cells. Would this indicate healthy tissue?

2. What are the domain and range of the formula above? Think about realistic values for x and y.

3. Graph the formula for cellular division for the domain and range you listed above.

4. What kind of relationship is there between number of cellular divisions and total number of cells?

4. Integrated Learning Activity (continued):

5. What would the domain and range be for the equation $y = 2^x$, if we consider all values which are mathematically (not just realistically) possible?

6. Graph the equation $y = 2^x$ for the domain and range values listed in problem 5.

7. What would the formula look like if a cell divided into four new cells instead of two?

8. Graph the formula from number 7.

9. How are the graphs from problems 3 and 7 similar? How are they different?

C. Assessment:

This activity may be assessed by collecting the handouts and grading them for accuracy or by having the student write a summary of the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. Intermediate Algebra text
b. Biology text

6. Integration of Technical/Academic Courses:

This activity relates algebra to biological applications for health related fields.

7. Developed by:	**Date Developed/Revised:**
Melissa Pedone	December, 1995

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Integrated Curriculum Activity
M-8

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Health, Biology, Business

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will examine and describe relationships between two variables expressed algebraically or graphically through the use of functions and functional notation.
c. The student will use the hand-held calculator to perform basic operations and to solve algebraic statements.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper or graphing calculator (e.g. TI-82)
b. LCD Overhead Panel for graphing calculator with overhead projector (optional)
c. TI-Graph Link with appropriate computer and printer (optional)

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing, point plotting for the graphing calculator.
b. Review the form for quadratic expressions and equations.
c. Review the methods for solving quadratic equations.
d. Review the methods for solving systems of three equations in three variables.
e. Review the form for exponential expressions and equations.
f. Review the methods for solving exponential equations using logarithms.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

After the age of 50, women are no longer produce the hormone estrogen. Studies have found that this hormone protects women from heart disease, but the use of estrogen after the age of 50 can contribute to an increase rate of endometrial cancer and breast cancer. Estrogen appears to raise HDL, the protective type of cholesterol while reducing LDL, the harmful type. According to the article, *Hormone and Your Heart*, **Prevention**, May 1995, pp. 70-78, estrogen replacement can reduce the risk of heart disease by 12 percentage points while increasing the risk of endometrial cancer up to 5 times the normal risk and breast cancer by 3 percentage points. (The addition of progesterone to estrogen treatment reduces the risk of endometrial cancer but maintains much of the reduction of heart disease.) We will look at the current data on death rates for women from heart disease and breast cancer and develop mathematical models that best describe each rate. This will provide a basis for comparison in the future when larger populations of women are using hormone replacement therapy.

CONTRASTING MATHEMATICAL MODELS: HEART DISEASE VS. BREAST CANCER

The following data has been gathered through 1992. (*Hormone and Your Heart*, **Prevention**, May 1995, p. 76)

AGE-GROUP	DEATHS PER 100,000 BREAST CANCER	DEATHS PER 100,000 HEART DISEASE
25-29	1.2	4.2
30-34	4.4	6.5
35-39	11.2	11.0
40-44	21.5	21.8
45-49	35.7	40.6
50-54	51.7	80.1
55-59	64.9	148.9
60-64	82.2	260.2
65-69	101.4	437.0
70-74	118.5	760.6
75-79	131.5	1307.6
80-84	154.6	2453.7

As you plot the points for the data given you should recognize the general shape of the quadratic and the exponential function. With only 12 data points, it may be difficult to decide between the two functions. We will consider both possibilities if necessary.

4. Integrated Learning Activity (continued):

Calculations

1. Work in groups of 3-4 students. Using the TI-82 calculator, enter the age group (a) in list 1 and the death rate (d) for breast cancer in list 2. Hint: Let the age group 25-29 correspond to a = 1. Assuming age to be the independent variable and death rate to be the dependent variable, determine the appropriate window that will show all the data filling most of the screen. Sketch your graph, labeling the axes.

2. Since it may be difficult to decide whether your points fall on an exponential curve or a quadratic curve, we will develop the best function for each model. Within your group, let each student pick 2 different points and write an exponential function, $d(a) = Ae^{ka}$. You will need to write 2 equations with the given data. By dividing both sides of the equations, you will be able to calculate "k". After determining k, you will be able to find A, by substituting into one of your original equations. Enter each function into Y=. Pick the "best" exponential model and explain why this model was chosen. Make a sketch of the graph of the "best" model indicating the window. (You may want to check with other groups to see what model they found to be the best.)

3. A quadratic model may be developed by determining the coordinates of 3 points. Using the function, $d(a) = pa^2 + qa + r$, we will need to find values for p, q, and r. Again, let each student in your group pick three points to use to calculate the constants p, q, and r. Write the three functions, substituting the values of the coordinates of the points. Now use the methods studied previously to solve the equations. Once you have the values for p, q, and r, write the quadratic function that results. As before, enter the function into Y= and determine the "best" function. Justify your choice. Sketch the graph indicating the window.

Questions

1. Are the values of A and k for the "best" model that you found in Calculations Step 2 reasonable estimates? Why or why not? Would averaging the values found give a better model? Try averaging the values and then explain whether you have a better model. Why or why not?

2. Are the values of p, q, and r that you found for the "best" model in Calculations Step 3 reasonable estimates? Why or why not? Would averaging the values found give a better model? Again try averaging the values and then explain whether you have a better model. Why or why not?

3. Which of the two models would you choose for predictions? Why?

4. Integrated Learning Activity (continued):

Questions (continued)

4. Using the model chosen in Question 3, calculate the death rates for breast cancer for the age groups 20-24 and 85-89. Show both algebraically and graphically. You may find that using a table may make it easier to find the values graphically. Hit 2nd WINDOW (TblSet). What value of a corresponds to the age group 20-24? List this as TblMin. Since our age groups are integers, use Δ Tbl = 1. Now hit 2nd GRAPH (TABLE) and find the values for a that correspond to the age groups needed.

5. Express the values found in Question 4 as percentages.

Extensions

1. Use the data in the heart disease column to find an exponential model for death rates due to heart disease. Choose the best model as before and sketch the graph of the model indicating the size of the window. Calculate the death rates for the age groups 20-24 and 85-89 algebraically and graphically (using TABLE) and express the rates as percentages. In older women (over 50), which is the leading cause of death. In younger women (under 50), which is the leading cause of death.

2. Find out what the other major causes of death are in women. Write a short report. If you can find data, develop models for other causes of death and include them in your report.

C. Assessment:

A completed written report may be used for assessment. Students may also give oral reports using the overhead projector to illustrate the graphs.

5. Instructor Resources/References:

a. TI-82 manual (or other calculator manual)
b. TI-Graph Link manual
c. Intermediate Algebra text
d. *Hormones and Your Heart*, **Prevention**, May 1995, p. 70-78

6. Integration of Technical/Academic Courses:

This topic integrates health, biology, and business with mathematics. Predictions are necessary to see whether medications are effective while insurance companies need models to set life insurance rates.

7. Developed by:	**Date Developed/Revised:**
Judith M. Jones	December, 1995

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Integrated Curriculum Activity
M-9

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Biology, Health Occupations

3. **Topic/Competency/Goal:**

   a. The student will evaluate an algebraic expression.
   b. The student will convert between English and metric measurements.
   c. The student will convert between metric measurements.

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   a. Calculator
   b. Variety of syringes calibrated in milliliters and 0.1 milliliter (demonstration only)
   c. Metric and English measurement conversion charts

   2. Preparation for Activity/Prerequisite

   a. Review operations with decimals.
   b. Review metric and English conversions.

   B. Description of Integrated Learning Activity

As a nurse, it is your job not only to administer the medication the doctor orders, but to check to see if it is safe. Using the information given in each problem below, decide whether the dosage requested is safe to administer.

4. Integrated Learning Activity (continued):

DOSAGE CALCULATIONS IN THE MEDICAL FIELD

The following formula is used to calculate a volume of a drug to be administered when the amount ordered is given in a weight.

$\frac{\text{DESIRED}}{\text{HAVE}}$ X AMOUNT where DESIRED is the amount(weight) of the medication ordered by the doctor, HAVE is the amount(weight) of medication in supply and AMOUNT is the volume of medicine containing the weight of medication in supply. For example, if Demerol is supplied in one milliliter vials each of which contain 50 mg of Demerol, then HAVE would be 50 mg and AMOUNT would be 1 ml. DESIRED would vary by patient. Work the following problems using the formula when necessary.

1. The dosage of Demerol is given as the mg of Demerol/kilogram of body weight/day. The recommended dose of Demerol is 3mg/kg/day for a maximum of 6 individual doses. For a 30-pound child, the doctor orders 50 mg every 4 hours as needed for pain to be given intramuscularly.
   a. Is the dosage safe? Explain your answer.
   b. If the source of Demerol you have available has 50mg/ml, how many milliliters of Demerol would you give every 4 hours to administer the correct dose?

2. The doctor orders Unipen 40 mg twice a day for a newborn who weighs 5000 grams. This is to be given intramuscularly. The recommended dosage is 10mg/kg of weight twice daily.
   a. Is this a safe dosage? Explain your answer.
   b. If the medication is supplied in a vial of 500 mg per 2m., how much should the infant receive per dose?

Solutions

1. a. No. The correct dosage is 40.8 mg/day. One dose would be 6.8mg every 4 hours.

   b. The proper dosage would be 0.14 ml.

2. a. Yes. This baby could have up to 50 mg of Unipen twice daily.

   b. The dosage should be 0.2 ml per dose.

4. Integrated Learning Activity (continued):

C. Assessment:

Students should complete the two problems working in groups. Students may research other types of drugs administered to children as well as how the drugs are packaged and can make up problems to be included on a test.

5. Instructor Resources/References:

1. *Principles of pharmacology for Medical Assisting* by Jane Rice
2. *Math for Meds* by Curren and Munday
3. *Mathematics for Health Occupations* by Kathi

6. Integration of Technical/Academic Courses:

Algebra can be integrated with the topic of drug dosage in the health areas.

7. Developed by:	**Date Developed/Revised:**
Tinker Cooper	December, 1995

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Integrated Curriculum Activity

M-10

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Geology, Earth Science, Construction Technology

3. **Topic/Competency/Goal:**

a. The student will calculate values using the log x key on a calculator.
b. The student will examine and describe relationships between two measurement on the Richter scale.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Scientific or graphing calculator

2. Preparation for Activity/Prerequisite

a. Review scientific notation.
b. Review the definition for logarithm.
c. Review the methods for finding logarithms with a calculator.

B. Description of Integrated Learning Activity

Since a seismograph measures intensity over such a large scale (up to the hundred millions), a more understandable scale was developed, the Richter scale. This scale keeps all earthquakes' ratings under ten. Because of the enormous range of intensities measured from earthquakes, a linear scale would still provide too large of a range. For that reason, the Richter scale is exponential. Although this keeps most people from fully understanding earthquakes' ratings, it does allow more people to have a basic understanding. The formula, $R = \text{Log}_{10} I$, is used to determine the Richter scale value, with R representing the Richter scale value, and I being the intensity measurement from the seismograph. The following worksheet can be used as a handout. Reference material is found at the end of the worksheet.

4. Integrated Learning Activity (continued):

EARTHQUAKEWORKSHEET

Formula: $R = \text{Log}_{10} I$

NOTE: The solutions are shown in parentheses after each problem.

1) If the seismograph reading in Mexico City (from 1985) measured the intensity at 126,000,000, what would be the Richter scale value? (Note: many calculators will require you to convert 126 million into scientific notation)

(R = 8.1. Thus, the Richter scale value for Mexico City's earthquake was 8.1.)

2) How many times more intense is an earthquake having a Richter scale value of 5, than an earthquake of value 6?

($5 = \log_{10} I$ $\quad$ $6 = \log_{10} II$

$I = 100{,}000$ $\quad$ $I = 1{,}000{,}000$

$$\frac{1\ 000\ 000}{100\ 000} = 10$$

Therefore, an R = 6 is ten times more intense than an R = 5.)

3) How much more intense was the earthquake in Kobe, Japan (1995) with a magnitude of 7.2, compared to Northridge, California's (1994) magnitude of 6.8?

$$\left(\frac{\text{inv log } 7.2}{\text{inv log } 6.8} = \frac{10^{7.2}}{10^{6.8}} = \frac{15\ 848\ 932}{6\ 309\ 573} = 2.51 \right.$$

Therefore, the Mexico City earthquake was 2.51 times more intense.)

4. Integrated Learning Activity (continued):

Extension

Research destruction caused by any earthquake of magnitude six or above. Some examples include:

Year	Location	Magnitude	Extra Notes
1995	Kobe, Japan	7.2	$30 billion damage
1994	Northridge, CA	6.8	$20 billion damage
1993	Marharashtra, India	6.4	30,000 deaths
1990	Northwestern Iran	7.7	40,000 deaths
1989	San Francisco, CA	6.9	$6 billion damage
1988	Northwest Armenia	6.8	55,000 dead/ $14 B
1976	Tangshan, China	8.2	242,000 deaths
1950	Assam, India	8.7	possible highest M
1556	Shaanxi, China	N/A	830,000 deaths

C. Assessment:

The worksheet should be completed. The extension could be assigned as a report. A question relating the use of logarithms in Richter scales should be included on a test of this material.

5. Instructor Resources/References:

a. 1995 World Almanac (contains enormous list of earthquakes)

b. Newsweek, January 30, 1995

6. Integration of Technical/Academic Courses:

This topic integrates several areas of science as well as coursework studied by students planning on entering the construction technology field with mathematics. Mathematics is necessary to convert the intensity of an earthquake into the more easily understood Richter scale.

7. **Developed by:** Kevin Kugler	**Date Developed/Revised:** December, 1995

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Integrated Curriculum Activity
# M-11

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Physics, Electronics

3. **Topic/Competency/Goal:**

   a. The student will analyze and solve verbal problems algebraically using linear equations or inequalities containing one or two variables.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Calculator
b. Worksheets
c. Resource materials or prepared electronics information

2. Preparation for Activity/Prerequisite

a. Review basic operations for exponents on a calculator.
b. Review the methods for solving linear equations.
c. Review the methods converting standard numbers to scientific notation and numbers written in scientific notation to standard notation.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

Following are worksheets with a collection of problems which apply mathematical formulas and principals in the areas of heat, energy, power, and electronic properties, as well as practical uses of scientific notation. The formulas are at a level which a student in the beginning of intermediate algebra should be able to work with. They may be given as one assignment or separated and spread out over a number of days. The instructor will need to do some preparation in vocabulary with the students before the assignments are given.

Vocabulary: Coulomb, Ohm, Volt, Ampere, Joule, Watt, Atom, Electron, Proton, Neutron

ELECTRONIC APPLICATIONS OF MATHEMATICS

Scientific Notation Problems

Show your work for each problem.

1. What are the parts of an atom?

2. What are the charges on the parts of an atom?

3. Which part of the atom is responsible for electric phenomena?

4. When an object gains electrons it has a ________________ charge.

5. What units do we measure charge in?

6. One Coulomb equals the charge on 6.25×10^{18} electrons. This number is in scientific notation. Write this number in standard form.

7. The charge on one electron is 1.6×10^{-19} Coulombs (C). Is this a large or small number?

8. Write the number 1.6×10^{-19} in standard form.

9. A number often used in calculating charges is Coulomb's constant, 9×10^{9}. Is this a large or small number?

4. Integrated Learning Activity (continued):

10. Write 9×10^{9} in standard form.

11. The speed of light is 300000000 m/s. Write this number in scientific notation.

12. A particle has a charge of .00000000015 C. Write this number in scientific notation.

Ohm's Law Problems

Ohm's Law is V=IR. Use Ohm's Law to solve the following problems:

1. What is an ohm?

2. What do the letters in the formula for Ohm's law stand for?

3. What units do we measure current in?

4. What units do we measure voltage in?

5. An automobile headlight with a resistance of 30 ohms, is placed across a 12-V battery. What is the current through the circuit?

6. A voltage of 75-V is placed across a 15-ohm resistor. What is the current through the resistor?

7. A transistor radio uses 2×10^{-4}A of current when operated by a 3-V battery. What is the resistance of the radio circuit?

8. Use Ohm's Law to calculate the voltage of a battery used in connection with a resistance of 60 ohms and a current of 0.4 A.

9. A lamp draws a current of 0.5 A when it is connected to a 12-V power source. What is the resistance of the lamp?

10. A motor with an operating resistance of 32 ohms is connected to a voltage source. The current in the circuit is 3.8 A. What is the voltage of the source?

4. Integrated Learning Activity (continued):

11. Draw a schematic to show a circuit that includes a 90-V battery, an ammeter, and a resistance of 45 ohms. What is the ammeter reading?

12. Draw a circuit diagram to include a 16 ohm resistor, a battery, and an ammeter that reads 1.75 A. Indicate the voltage of the battery.

13. Draw a circuit diagram to include a 60-V battery, an ammeter, and a resistance of 12.5 ohms. Indicate the ammeter reading.

Power, Energy, and Heat Problems

The power (energy per unit time) used by an electric circuit can be found by using the equation P=VI and is measured in joules per second (j/s) or watts (W). Power is the rate at which something uses energy. Energy (W) is calculated using W=Pt where P is power and t is time. Energy is measured in Joules (j). Use these formulas to answer the following questions:

1. A 12-V automobile battery causes a current of 2.0 A to flow through a lamp. What is the power rating of the lamp?

2. The current through a toaster connected to a 120-V source is 8.0 A. What is the power rating of the toaster?

3. A light bulb uses 1.2 A when connected across a 120-V source. What is the wattage of the bulb?

4. What current flows through a 75-W light bulb connected to a 120-V outlet?

5. The current through a light bulb connected across terminals of a 120-V outlet is 0.5 A. At what rate does the bulb use electric energy?

6. The current of the starter motor of a car connected to a 12-V battery is 210 A. What electric energy is delivered to the starter in 10 seconds?

4. Integrated Learning Activity (continued):

7. A flashlight bulb is connected across a 3.0-V difference in potential. The current through the lamp is 1.5A.
   a) What is the power rating of the lamp?

   b) How much electric energy does the lamp convert in 10 min.? (Hint: convert min. to sec.)

8. A lamp draws 0.50 A from a 120-V generator.
   a) How much power does the generator deliver?

   b) How much energy does the lamp convert in 5 minutes?

9. Combine the formula for power, P=VI, and Ohm's Law, V=IR, into one formula for power (P=...) which does not contain the variable V (voltage).

10. Solve the formula from problem 9 for I and for R. I=?   R=?

11. A 15 ohm heater operates on a 120-V outlet.
   a. What is the current through the heater?

   b. How much energy is used by the heater in 30 seconds?

12. A 30 ohm resistor is connected to a 60-V battery.
   a. What is the current in the circuit?

   b. How much energy is used by the resistor in 5 minutes?

13. A 100-W bulb is 20% efficient. That means 20% of the electric energy is converted into light energy. How many joules does the light bulb convert into light each minute it is in operation?

The electric energy transferred to a resistor for a certain amount of time is equal to I^2RT. If this energy is thermal (heat) energy, the increase in thermal energy is calculated using the formula $Q=I^2Rt$ where Q is heat energy and is measured in joules. I, R, and t are current, resistance, and time respectively. Use this formula to answer the following questions.

4. Integrated Learning Activity (continued):

14. How many joules of heat does the light bulb in problem 13 produce each minute?

15. The resistance of an electric stove element at operating temperature is 11 ohms.
    a. 220-V are applied across it. What is the current through the element?

    b. How much energy does the unit use in 30 seconds?

16. How much energy does a 60-W light bulb use in half an hour?

C. Assessment:

This assignment may be assessed by collecting the worksheets and grading for accuracy, class discussion to assess understanding, or having the student write a summary on the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. Intermediate Algebra text
b. Physics text
c. Electronics text

6. Integration of Technical/Academic Courses:

Technical courses in electronics are integrated through the use of actual scientific and electronic formulas and principles in real-world word problems to physics and mathematics.

7. **Developed by:**	**Date Developed/Revised:**
Melissa Pedone	December, 1995

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Orange County Public Schools • Osceola District Schools • Valencia Community College

Integrated Curriculum Activity
M-12

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Health, Biology

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will examine and describe relationships between two variables expressed algebraically or graphically through the use of functions and functional notation.
c. The student will use the hand-held calculator to perform basic operations and to solve algebraic statements.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper or graphing calculator (e.g. TI-82)
b. LCD Overhead Panel for graphing calculator with overhead projector (optional)
c. TI-Graph Link with appropriate computer and printer (optional)

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing, point plotting for the graphing calculator.
b. Review the form for exponential expressions and equations.
c. Review the methods for solving exponential equations using logarithms.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

The spread of viral diseases can be represented by an exponential growth function. This activity will allow students to estimate the growth rate with a graphical approach in addition to determining the growth rate algebraically with logarithms.

ESTIMATING THE EXPONENTIAL GROWTH RATE FOR THE SPREAD OF A VIRUS

The mysterious virus algebola has struck our algebra class. We have all been put into quarantine until the virus has run its course. The major symptoms are the inability to solve any equations containing fractions and the loss from memory of all properties of logarithms. This virus takes less than a minute to spread for one person to another, so if we are to determine information about the growth rate, we must collect data and analyze it quickly.

To simulate the spread of the virus, we will use the random number generator on the TI-82 calculator. (To be sure that each calculator used during this exercise generates a different series of random numbers, go to the MATH menu, choose PRB, choose rand and enter the last 4 digits of your social security number following the rand command. Hit enter 3 times.)

We will now set up a random number generator that will choose any number from 1 up to the total number of students in the class. Since we only want to use integers for our random numbers, we will use the command iPart that chooses only the integer value equal to or below the number of students in the class. Go to the home screen, choose MATH, choose NUM, and choose iPart. Now go back to MATH, choose PRB, and then rand. Finally, enter the total number of students, n. Hit ENTER a few times to see that you are getting integer values that are $\leq$ n. Students should count off so that each student has a different number.

To spread the virus, the instructor will use the random number generator to identify the student who initially contracted the virus and brought it to class. (Note: The instructor is immune to this dreaded virus.) The "infected student" will stand up and will generate a number. The student identified by this number will stand up to join the first student. Now both students will generate random numbers, identifying additional cases of the virus. The teacher should record the data in the format (t,n) where t represents the number of times that the students generate a group of random numbers and n is the total number of students standing. (The initial student standing should be represented as (0,1)). Let the virus spread until at least 5 data points are collected or until all students are standing. Working in groups, complete the calculations to determine a value for the exponential growth constant to 2 decimal places and then write the function describing the growth of the algebola virus.

4. Integrated Learning Activity (continued):

Calculations

1. Plot each set of points using the STAT menu. The first coordinate should be tabulated in list L1 and the second coordinate in list L2. Determine an appropriate window to be used and then use STATPLOT to plot the points. Use trace to check that each of your points is correct. Make a sketch of the window indicating the size of the window used.

2. Write an exponential function for each of the other data points, substituting in the coordinates for f(t) and t. Set each equation produced equal to zero. Turn off your STATPLOT and graph each equation separately and determine by TRACE and ZOOM IN, the value of k that solves the equation. (You may want to adjust your window to see the intercept more clearly.) List the value of k determined and the size of the last window used.

3. Average the values of k that you obtained from step 2, and write the function in the form, $f(t) = ae^{kt}$. Enter this function into the Y= menu and graph. (Be sure to check the size of the window needed to plot the function.) Turn on the STATPLOT to be sure that all of the data points plotted in step 1 are also included. Sketch the result indicating the size of the window.

Questions

1. Is the value of k that you found in Calculations Step 3 a reasonable estimate? Why or why not?

2. Assuming the time (t) to spread the virus is measured in minutes, use the graph obtained in Calculations, step 3 to determine how long it would take to completely infect **all** the members of your class? (Report to the nearest 0.1 minute.)

3. If you were able to take a picture of a class that had 100 students after 6 minutes, how many students would be standing? To what accuracy should this answer be reported? Why?

4. If the growth rate, k, were cut in half, how long would it take to infect all the members of the class? (Hint: Use a graph to answer the question.)

5. Use algebraic methods to solve the equations found in Calculations, step 2. Again average the values of k obtained. Do the values obtained algebraically and graphically agree? If not, why not?

4. Integrated Learning Activity (continued):

Extensions

1. Both linear functions and exponential functions can be written with only the information given from two data points. Use point 1 and point 3 from the original data to write a linear function. Calculate the time it would take to infect **all** students in the class. Compare the time to the time found in Question 2. Graph both the exponential and the linear function in the same window. Over what period of time do the two functions produce similar results? If the medical profession were faced with a highly contagious disease, which model would they prefer to have the time to find a cure?

2. Chickenpox usually take about 13 days from the time of exposure until a rash appears (incubation period). Assume that a student comes to our class on the first day that he/she is able to spread the chickenpox and that from that moment we are put into isolation. Also assume that no one is immune to chickenpox. Use the number of students that we obtained in the 5 data points used originally and change the value of t based on the incubation period given. Determine the function that will describe the spread of chickenpox through a group of people that meet the conditions we set above. Report k to 3 decimal places. (You may use graphical or algebraic methods.)

How long would it take for the entire class to be infected? How many students would be infected after 3 weeks? After 6 weeks?

C. Assessment:

A completed written report may be used for assessment. Students may also give oral reports using the overhead projector to illustrate the graphs. A question related to exponential growth or decay should be included on a test given on exponential and logarithmic functions. This question should provide two data points and students should write a function describing the relationship and be able to answer questions based on the model.

5. Instructor Resources/References:

a. TI-82 manual (or other calculator manual)
b. TI-Graph Link manual
c. Intermediate Algebra text
d. A medical guide such as *Better Homes and Gardens Family Medical Guide* , edited by Donald G. Cooley, 1973, Meredith Corporation.
e. Unpublished paper presented at T^3 Conference, 3/4/95, by Jolene Rhodes, "Finding the value of k"

6. Integration of Technical/Academic Courses:

Simulation of spread of disease integrates theoretical mathematics with the areas of health and biology.

7. Developed by:	**Date Developed/Revised:**
Judith M. Jones	December, 1995

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Integrated Curriculum Activity

# M-13

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Space Science, Physics

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve quadratic equations.
b. The student will be able to write an equation related to a given equation by finding the square roots of each member of an equation.
c. The student will be able to calculate approximate decimal values for radical expressions by using a scientific or graphing calculator.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Scientific or graphing calculator

2. Preparation for Activity/Prerequisite

a. Review basic operations of finding roots with a scientific or graphing calculator.
c. Review the methods for solving quadratic equations.

B. Description of Integrated Learning Activity

A formula can be used to calculate the distance an object free falls based on the time it has been falling, its initial velocity, and the height from which it is falling. Some real life examples of free falling are sky divers, supplies or bombs dropped from airplanes, and the space shuttle's solid rocket boosters fall to earth.

The following worksheet provides the formula used and a description of what each variable represents. The solutions to the problems are included.

4. Integrated Learning Activity (continued):

FREE FALL WORKSHEET

The formula for free falling objects is:

$h = -16t^2 + h_0$

where h = height above the earth's surface of the object in feet
t = time in seconds of the fall
h_0 = initial height above the earth's surface in feet

1. a. A sky diver waits 10 seconds before pulling the rip cord after leaving the plane. If the airplane's height was 8000 feet, how far did the sky diver free fall before the parachute opened?

b. If 3000 feet are required for safely opening the parachute and landing, what is the longest time a sky diver could safely free fall before pulling the rip cord if he she jumped from 8000 feet?

2. a. The air force wants to drop a bomb from a jet flying at 15,000 feet. The bomb should detonate 100 feet before impact. How many seconds should the timer delay before detonating the bomb?

b. How many seconds for error is there in the calculations before the bomb would hit the ground? (How long would it take the bomb to drop the extra 100 feet?)

3. A tourist standing at the peak of the Sear's Tower drops a penny. If the Tower is 1454 feet tall, how long until the penny hits the ground?

4. If a satellite orbiting at 35 miles above the earth lost power, how long would it take before it crashed into the earth?

Solutions

1. a. $h = -16(10)^2 + 8000$
$h = 7840$ (After 10 seconds the skydiver is 7840 feet above the ground.)
$8000 - 7840 = 160$
The sky diver fell 160 feet.

4. Integrated Learning Activity (continued):

1. b. $3000 = -16t^2 + 8000$
   $t = 17.7$
   The sky diver could safely wait 17.7 seconds before pulling the rip cord.

2. a. $100 = -16t^2 + 15000$
   $t = 30.516$
   The timer should delay detonation for 30.516 seconds.

   b. $0 = -16t^2 + 15000$
   $t = 30.619$
   The bomb will hit the earth after 30.619 seconds.
   $30.619 - 30.516 = 0.103$
   There is only 0.103 seconds allowed for error in detonation.

3. $0 = -16t^2 + 1454$
   $t = 9.5$
   It would take 9.5 seconds to hit the ground.

4. 35 miles x 5280 feet/mile = 184,800 feet
   $0 = -16t^2 + 184{,}800$
   $t = 107.5$
   It would take 107.5 seconds or 1 minute 47.5 seconds to return to the earth's surface.

Extension

The students could research other falling objects. For example, they could calculate the time it takes water to fall from the highest water falls in the world or the time it took pieces of Sky Lab to fall back to earth. A brief written report could be prepared.

C. Assessment:

The students should complete the worksheet. The students could turn in the extension as a brief report. A test question including the free fall formula should be included on a test of solving quadratic equations.

5. Instructor Resources/References:

a. *Cambridge Encyclopedia*
b. *Merrill Integrated Math Course 3*

6. Integration of Technical/Academic Courses:

This activity integrates space science, physics and mathematics through the use of the free fall equation.

7. Developed by:	**Date Developed/Revised:**
Kevin Kugler	December, 1995

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Integrated Curriculum Activity
# M-14

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Agriculture, Ecology

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will evaluate algebraic expressions.
c. The student will solve and use exponential or logarithmic equations involving integer exponents only
d. The student will solve verbal problems which will require exponential or logarithmic equations for solutions.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Checker board
b. Cat litter
c. Scientific or Graphing calculator
d. Graph paper

2. Preparation for Activity/Prerequisite

a. Review evaluation of algebraic expressions.
b. Review calculation of exponential and logarithmic expressions.
c. Review solving exponential and logarithmic equations.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

Many quantities, such as bacteria, increase in number by doubling in amount at regular intervals.

GROWING EXPONENTIALLY

Problem: You will study how the population of a particular type grows if the number doubles at a regular interval by using a checkerboard. As the number of grains of cat litter doubles from one square to the next, the equation that describes the doubling process is

$$N = 2^{(x - 1)}$$

where N = the number of grains of cat litter on a checkerboard square
x = the number of checkerboard squares, counting from the first square represented as x = 1 to any other square.

Procedure:

1. Place one grain of cat litter on square 1, two grains of cat litter on square 2, four grains of cat litter on square 3, eight grains of cat litter on square 4, and so on. Continue the process to square 8.

2. For squares 1 through 8, make a table showing the number of the square and the corresponding grains of cat litter on each square.

Number of square	Number of grains

3. For squares 1 through 8, use your graph paper to make a graph of the square number (horizontal axis) versus the number of grains of cat litter on the square (vertical axis). Describe the graph below.

4. Use the formula and your calculator to predict the number of grains of cat litter on squares 9 through 16 of the checkerboard.

Number of square	Number of grains

4. Integrated Learning Activity (continued):

5. Using your graph paper, plot a graph of square number (horizontal axis0 versus the number of grains of cat litter on the squre (vertical axis) for squares 9 through 16. Describe below and compare to the graph in 3.

6. Add the number of grains of cat litter on squares 1 through 7. ___________

How many grains of cat litter are on square number 8? ___________

7. Add the number of grains of cat litter on squares 1 through 15. _________

How many grains of cat litter on square number 16? ___________

8. Is there a pattern? If so, based on this pattern, what would you predict the sum of the number of grains of cat litter on squares 1 through 63? ___________

9. Using your equation solving ability and the given formula, if N = 128, what would be the number on the checkerboard square that would contain 128 grains of cat litter. Show your work.

10. Using your equation solving ability, logarithms, and the given formula, if n = 265, between what two numbers on the checkerboard square would you find 265 grains of cat litter? Show your work.

11. Bonus: You have a very wealthy aunt who knows that you are taking mathematics. She wants to know how much you are learning so she decides to test you with two offers. her first offer is to give you ten million dollars today. her second offer is to put aside one dollar today, double that to two dollars tomorrow, then double that to four dollars the next day, and so on, for thirty days. On the thirtieth day, you can have the inal doubled amount. She wants to know which offer you will accept. What do you tell her and why?

C. Assessment:

Completion of the activity will be evaluated to measure the student understanding of mathematical applications of exponential and logarithmic equations as they relate to biology, ecology and agriculture.

5. Instructor Resources/References:

a. Algebra texts

6. Integration of Technical/Academic Courses:

This application is used to model exponential growth of any type both mathematically and graphically as it could apply to topics in agriculture, biology, ecology and algebra.

7. Developed by:	**Date Developed/Revised:**
Ninette May	December, 1995

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Integrated Curriculum Activity
# M-15

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Business

3. **Topic/Competency/Goal:**

   a. The student will perform appropriate algebraic operations to solve equations.
   b. The student will examine and describe relationships between two variables expressed algebraically or graphically through the use of functions and functional notation.
   c. The student will analyze and solve verbal problems algebraically using linear equations containing one variable.
   d. The student will solve systems of linear equations and inequalities.

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   a. Two types of cookies
   b. Graph paper
   c. Graphing calculator
   d. Computer spreadsheet software (optional)

   2. Preparation for Activity/Prerequisite

   a. Review basic operations of graphing, point plotting for the graphing calculator.
   b. Review mathematical concepts in linear systems and inequalities.
   c. Review mathematical concepts in linear programming.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

Decision makers in many fields, including business and science, try to find ways to allocate resources in order to maximize profit or productivity and to minimize costs.

HOLIDAY COOKIE COMPANY

Problem; You are a member of the decision making team of the Holiday Cookie Company. Two types of cookies can be produced at various times with variable profit per bag of cookies. You need to decide how many bags of each type should be produced per minute in order to maximize profits.

Procedure:

1. Choose a variable to represent type 1 cookie.

   Name of cookie: ______________________ Variable: __________

2. Choose a variable to represent type 2 cookie.

   Name of cookie: ______________________ Variable: __________

3. Count the cookies in each bag and complete the business restrictions below. (Insert the variable representing each type of cookie in the ( ).

Each bag of type 1 cookies ( ) contains ___________ cookies while each bag of type 2 cookies ( ) contains ____ cookies. The company cannot produce more than 150 cookies per hour but at least 15 bags of type 1 ( ) and at least 20 bags of type 2 ( ) must be produced per hour. From past experience, the profit per bag of cookies of type 1 ( ) is 10 cents and the profit per bag of cookies of type 2 ( ) is 5 cents.

4. Organize your business formulas and data in a spreadsheet/table.

4. Integrated Learning Activity (continued):

5. Write an objective function that will describe the quantity to be maximized or minimized.

Total profit = profit on the bag of type 1 cookie + profit on the bag of type 2 cookie

_________ = __________________ + ____________________

6. Write the constraint functions below:

a. ____________________________ Total number of bags produced in one hour

b. ____________________________ Number of bags of type 1 cookie (   )

c. ____________________________ Number of bags of type 2 cookie (   )

7. Graph the three constraint functions on the graph paper provided. Label each constraint equation and shade in the feasible region. Label the 3 vertices.

8. Find the vertices in quadrant 1 by solving the pairs of constraint equations in step 6. Show your work.

Vertex 1: Vertex 2: Vertex 3:

9. Evaluate the profit represented by the objective function at each vertex to find the maximum profit. Fill in the chart below.

Vertex	P
______	_______
______	_______
______	_______
______	_______

10. How many bags of each type of cookie should be produced per hour?

Type 1 (   ) __________ bags per hour

Type 2 (   ) __________ bags per hour

11. The Holiday Cookie Company has an overhead of $30,000 a year plus a production cost of $2500 per week. Each week brings in $3125. How many bags of cookies need to be sold per week to "break-even"? (Hint: cost = revenue)

4. Integrated Learning Activity (continued):

12. What type of cookie should the Holiday Cookie Company produce more of?

13. Which type, do you think, is the better buy? Explain.

C. Assessment:

Completion of the activity will be evaluated to measure the student understanding of mathematical applications to business.

5. Instructor Resources/References:

a. Algebra texts

6. Integration of Technical/Academic Courses:

This application is used to model or predict success or failure in a business venture both mathematically and graphically.

7. Developed by:	**Date Developed/Revised:**
Ninette May	December, 1995

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Integrated Curriculum Activity
# M-16

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Physics, Geometry, Electronics

3. **Topic/Competency/Goal:**

   a. The student will analyze and solve verbal problems algebraically using the Pythagorean Theorem.
   b. The student will solve problems involving the impedance formula.

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   a. Calculator
   b. Paper
   c. Equipment for lecture presentation

   2. Preparation for Activity/Prerequisite

   a. Review the Pythagorean Theorem.
   b. Review the methods for solving quadratic equations.
   c. Review the methods for finding roots and powers using a calculator.

   B. Description of Integrated Learning Activity:

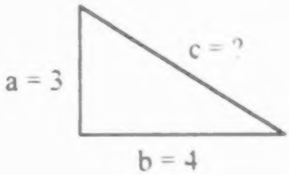
The goal of this activity is to relate the Pythagorean Theorem ($a^2 + b^2 = c^2$) to right triangles in algebra and geometry to the Impedance Formula ($R^2 + X_L{}^2 = Z^2$) in electronics.

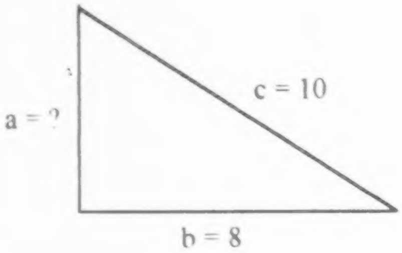
4. Integrated Learning Activity (continued):

THE IMPEDANCE FORMULA IN ELECTRONICS

The Pythagorean Theorem allows us to calculate one side of a right triangle using the relationship $a^2 + b^2 = c^2$ as shown in the triangle below.

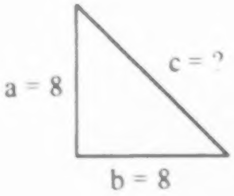
1. Calculate the missing side





Note that the ratio of the sides in each of these triangles is 3:4:5

2. An isosceles triangle has two equal sides. Find the missing side in the isosceles triangle below.



3. Draw a triangle to represent each of the following and find the missing side.

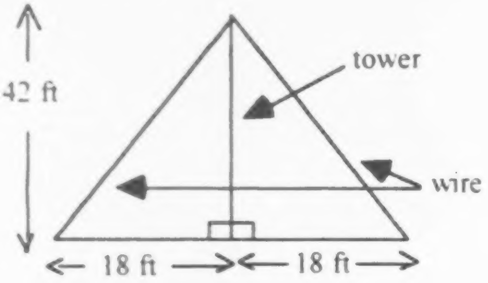
A. $a = 12$, $b = 5$, $c = ?$

B. $a = 7$, $b = ?$, $c = 10$

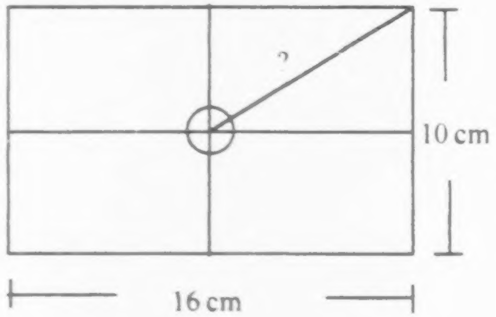
C. $a = ?$, $b = 10$, $c = 20$

4. Integrated Learning Activity (continued):

4. An antenna tower is supported by two wires. Use the diagram below to find the total length of wire to support the tower.



5. A photocell is mounted in the center of the circuit board in this diagram. How far is the center of the cell from any corner of the board?



The impedance formula is $R^2 + X_L{}^2 = Z^2$ where R is the circuit resistance, X_L is the circuit reactance, and Z is the impedance. All three variables are measured in ohms (Ω). If this formula is compared to the Pythagorean Theorem, Z could be represented as the hypotenuse of a right triangle while R and XL would be the two legs of the triangle. Using the impedance formula, work each of the following problems.

6. Find the inductive reactance (X_L) if the impedance is 4.2 Ω and the resistance is 3.6 Ω.

7. Find the circuit resistance when the impedance is 8 kΩ and the reactance is 4 kΩ.

8. Find the impedance if the resistance is 12 kΩ and the reactance is 15 kΩ.

4. Integrated Learning Activity (continued):

9. A coil has a reactance of 15 kΩ and is in series with a 12 kΩ resistor. Find the circuit impedance to the nearest tenth.

10. The impedance of a resistance-inductive circuit is 35 kΩ. Find the inductive reactance if R = 28 kΩ.

C. Assessment:

This assignment may be assessed by collecting the worksheets and grading for accuracy. Word problems using the Pythagorean Theorem and the impedance formula may be included on a test.

5. Instructor Resources/References:

a. *Mathematics for Electronics* by Nancy Myers
b. *Elementary Algebra* by Johnson Steffensen
c. *Basic Mathematics for the Trade and Technologies* by Cleaves, Hobbs and Dudenhefer

6. Integration of Technical/Academic Courses:

By using the Pythagorean Theorem and relating it to the impedance formula, algebra, geometry and the field of electronics can be related.

7. Developed by:	**Date Developed/Revised:**
Tinker Cooper	December, 1995

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Integrated Curriculum Activity
# M-17

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Business, Financial Services

3. **Topic/Competency/Goal:**

   a. The student will write linear functions from real data.
   b. The student will graph linear piecewise functions.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper
b. Federal tax rate schedules (most recent)
c. Calculator

2. Preparation for Activity/Prerequisite

a. Review the concept of slope.
b. Review the point slope form of the equation of a line.
c. Review Cartesian coordinate system.
d. Review the concept of domain.

B. Description of Integrated Learning Activity

The federal income tax tables and many state income tax tables can be converted into a set of linear piecewise functions. Students may use both the linear functions and the graphs produced to find taxes to be paid for various incomes.

4. Integrated Learning Activity (continued):

INCOME TAXES AS PIECEWISE FUNCTIONS

1. Using the federal tax rate schedules, select Schedule X, Schedule Y-1, Schedule Y-2 or Schedule Z. Find two points for each line on the chosen schedule with the first coordinate representing the income and the second coordinate representing the tax on that income. For example, in 1993, Schedule X (Single filing status) shows that if you earn from $0- $22,100, you should pay 15% of that amount in taxes. That will translate into 2 points: (0,0) and (22 100, 3315). Use the minimum amount and the maximum amount of income for your choices of points for each line of the schedule and follow the description for calculating the tax. List the 5 pairs of points.

2. For each pair of points found in 1, calculate the slope of the line that would connect the points. What does the value of the slope represent? Then find the equation of each line using the point slope form, $y - y_1 = m(x - x_1)$. What is the domain of each of the functions?

3. Graph the 5 linear functions that you have written in 2 being sure to consider the domain.

4. Compare the functions that you have written to the tax schedules. What pattern do you see?

5. Compare the amount of tax required on your schedule if you earned $50,000 to the amount of tax paid on the other schedules. Are all schedules the same? Which filing status seems to provide the best tax advantage?

C. Assessment:

This activity may be assessed by collecting the handouts and grading them for accuracy. Students may research and discuss the implications of tax issues such as the "marriage tax" or the flat tax proposal.

5. Instructor Resources/References:

a. Intermediate algebra text
b. Federal or state income tax schedules

6. Integration of Technical/Academic Courses:

This activity relates the topic of piecewise functions from algebra to the topic of tax rates in financial services and business.

7. Developed by:	**Date Developed/Revised:**
Tim Williams	December, 1995

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Integrated Curriculum Activity
# M-18

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Business, Financial Services

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will solve and use exponential or logarithmic equations involving integer exponents only.
c. The student will solve verbal problems which will require exponential or logarithmic equations for solutions.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper
b. Worksheet
c. Scientific calculator

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing
b. Review the meaning of domain and range.
c. Review the methods for solving linear equations.
d. Review the form for exponential expressions and equations.
e. Review the methods for solving exponential equations using logarithms.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

In this activity, students are given a nonlinear equation which is used to determine the new price of an item after years of inflation. The students first complete an example problem. Next, they complete two graphing assignments based on the formula and determine which variable causes a linear relationship and which variable creates a nonlinear (exponential) relationship. Students are also questioned on domain and range. This activity would be a good lead-in into exponential or logarithmic functions.

INFLATION RATE

Inflation is the rate at which prices increase over time. (A decrease in price is called deflation.) It is based on an average annual percentage and can range from no inflation (0%) to unlimited growth. The formula below is used to determine the new price of an item after years of inflation.

$$C = P(1 + i)^n$$

C = new cost of item
i = annual interest rate (in decimal form)
n = number of years
p = original price

1. Use the above formula to complete the following problems:
   a. What would the new price for a $1.09 loaf of bread be after 10 years, if the average annual inflation rate is 2.25%?

   b. What would the average cost of a new car be in the year 2010, if the average price for a new car in 1995 is $15,800 and the average inflation rate for that period of time is 3.75%?

2. Rewrite the formula with a constant inflation rate of 2.25%, a time period of 8 years, and a variable original price.

3. Graph the equation you have written from number 2.

4. What is the relationship between new cost and original price with constant inflation rate and time?

4. Integrated Learning Activity (continued):

5. What is the domain of the equation from number 2? (Remember which values for P are realistic.)

6. What is the range of the equation from number 2?

7. Extend the line graphed in problem 4 to estimate the new cost of an item with an original price of $20.

8. Rewrite the original formula with a constant rate of inflation of 2.25%, an original price of $3, and a variable period of time.

9. Graph the equation from problem 8.

10. What is the domain and the range for the equation you just graphed? Verify your answer by checking your graph. (HINT: Remember which values of n can realistically be placed in the formula!)

11. What type of relationship is displayed in the graph from problem 9?

C. Assessment:

This activity may be assessed by collecting the handouts and grading them for accuracy or by having the student write a summary of the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. Intermediate Algebra text

6. Integration of Technical/Academic Courses:

This activity relates algebra to business and finance applications.

7. **Developed by:**	**Date Developed/Revised:**
Melissa Pedone	December, 1995

Valencia Community College
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Integrated Curriculum Activity
M-19

1. **Discipline/Course Unit:** Mathematics Intermediate Algebra

2. **Related Disciplines:** Algebra, Business, Financial Services

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will solve and use exponential or logarithmic equations involving integer exponents only.
c. The student will solve verbal problems which will require exponential or logarithmic equations for solutions.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper
b. Worksheet
c. Scientific calculator

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing
b. Review the methods for solving linear equations.
c. Review the form for exponential expressions and equations.
d. Review the methods for solving exponential equations.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

In this activity, students are given a nonlinear equation which is used to determine the monthly payments on an installment loan, in this case a car loan. The students first complete an example problem. Next, they collect some of their own information (or use information provided by the instructor)and use the formula again. Next, they complete two graphing assignments based on the formula and determine which variable causes a linear relationship and which variable creates a nonlinear relationship. This activity would be a good lead-in into exponential or logarithmic functions.

I WANT TO SELL YOU A CAR

The formula below is used to determine the monthly payments on an installment loan such as a car loan.

$$R = P\left(\frac{i/12}{1-(1+i/12)^{-n}} \right)$$

P = principal amount of the loan
i = annual interest rate (in decimal form)
n = number of monthly payments
R = amount of monthly payment

1. Use the above formula to complete the following problems:

   a. What would the monthly payment be for a car if the amount of the loan is $12,500, the going interest rate is 8.25%, and you want to pay the car off in 3 years?

   b. What would the total cost of the car be after you pay it off, if you had to make an initial down payment of $2,500?

4. Integrated Learning Activity (continued):

2. Collect information (or use information provided by your instructor) and create your own problem. Contact a local bank for the going interest rates. Call or visit a car sales lot and determine the average price for a car you would be interested in buying. Determine the number of months you would need to pay it off. Write the information you collect below.

Interest rate ______________ Source ____________________

Type of car ___________________

Price of car __________________ Source _____________________

Number of months _____________

Use the formula above to determine the monthly payments:

Monthly payment ___________________

3. Graph the above formula with a constant interest rate of 12%, a constant of 60 monthly payments, and a variable principal between $10,000 and $25,000.

4. Is the relationship between principal and monthly payment a linear relationship? (with fixed interest rate and number of months)

5. Graph the same formula with a constant principal of $15,000, constant interest rate of 12%, and a variable number of monthly payments from 24 months to 60 months.

6. Is the relationship between number of monthly payments and monthly payment amount a linear relationship?

C. Assessment:

This activity may be assessed by collecting the handouts and grading them for accuracy or by having the student write a summary of the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. Intermediate algebra text
b. Loan department of local banks
c. Sales prices for cars

6. Integration of Technical/Academic Courses:

This activity relates algebra to business and finance applications

7. Developed by:	**Date Developed/Revised:**
Melissa Pedone	December, 1995

Valencia Community College
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Orlando, FL 32802

Integrated Curriculum Activity
# M-20

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Physics, Engineering Technology

3. **Topic/Competency/Goal:**

   a. The student will perform appropriate algebraic operations to solve equations.
   b. The student will solve and use rational equations.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper
b. Worksheet
c. Scientific calculator

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing
b. Review the meaning of domain and range.
c. Review the methods for solving rational equations.

B. Description of Integrated Learning Activity

In this activity, students are given a formula for determining light intensity which is a rational equation. The students first complete an example problem. Next, they complete graphing assignments based on the formula. This activity would be a good lead-in into nonlinear functions or rational equations.

4. Integrated Learning Activity (continued):

LIGHT INTENSITY

Photographers need to determine light intensity to determine the type of film and exposure time to use to insure quality pictures. The following formula is used to calculate light intensity:

$$I = \frac{72}{d^2}$$

I = amount of light in lumens/unit area
(ex: 3 lumens/square foot)

d = distance of object from light source

1. Determine I if an object is 3 ft. away from the light source.

2. Realistically, what are the only values of d which will actually be placed in the formula?

3. Mathematically, what values of d could be placed into the formula? (Domain)

4. What values of I are possible? (Range)

5. Make a table of values for d and I and graph the formula. (Use only $d > 0$).

6. Is the relationship linear?

7. Describe the relationship?

8. Why will I never be equal to zero?

9. If we allow for all values of d except zero, what will the graph look like?

C. Assessment:

This activity may be assessed by collecting the handouts and grading them for accuracy or by having the student write a summary of the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. Intermediate Algebra text

b. Physics text

6. Integration of Technical/Academic Courses:

This activity relates algebra and physics to engineering applications related to light

7. Developed by:	**Date Developed/Revised:**
Melissa Pedone	December, 1995

Integrated Curriculum Activity
M-21

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Business, Economics

3. **Topic/Competency/Goal:**

   a. The student will analyze and solve verbal problems algebraically using linear equations or inequalities containing one or two variables.
   b. The student will solve systems of linear equations and inequalities

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper
b. Straight edge
c. Overhead projector
d. Transparencies
e. Computer and appropriate software(optional)

2. Preparation for Activity/Prerequisite

a. Review translation of relevant data into meaningful equations or inequalities.
b. Review graphing a relation on a Cartesian coordinate system.
c. Review evaluation of a polynomial.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

The next logical step for students who are introduced to the concept of graphing linear inequalities is problem solving via linear programming. This technique that can be used to calculate and visualize maximum profits and minimum costs for a given business situation.

MAXIMIZING PROFITS

You are a manufacturer of two different models of racing bikes. You have determined that it takes 2 hours to assemble model A and 1 hour to assemble model B. Your labor force is available 22 hours per day. With your facilities, you can assemble 8 of the model A bikes at a profit of $40 each per day and 10 of the model B bikes at a profit of $30 each per day. Find the number of each model you should manufacture each day in order to gain a maximum profit.

1) Write two inequalities (constraints) that represent the fact that you must assemble a nonnegative number of each model.

2) Write two inequalities that represent the most number of each model that you can assemble each day.

3) Write one inequality that represents the most number of hours of labor available to you each day.

4) Graph the system of inequalities by hand and find the feasibility region.

5) Identify the corner points. Optional: Use a computer to check your work. What do these points represent?

6) Write an equation that represents your total profit in one day.

7) How many of each model should be assembled each day in order to maximize profits? Make a chart to illustrate your conclusion.

C. Assessment:

Students could investigate a business that interests them and include analysis in portfolio.

5. Instructor Resources/References:

a. Intermediate Algebra text and Algebra 2 text
b. Economics text
c. Algebra software

6. Integration of Technical/Academic Courses:

The student is using algebraic techniques to represent and analyze a business scenario

7. Developed by:	**Date Developed/Revised:**
Jackie DiMartino	December, 1995

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Integrated Curriculum Activity
# M-22

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Health, Biology, Chemistry

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will examine and describe relationships between two variables expressed algebraically or graphically through the use of functions and functional notation.
c. The student will use the hand-held calculator to perform basic operations and to solve algebraic statements.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper or graphing calculator (e.g. TI-82)
b. LCD Overhead Panel for graphing calculator with overhead projector (optional)
c. TI-Graph Link with appropriate computer and printer (optional)

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing, point plotting for the graphing calculator.
b. Review the form for exponential expressions and equations.
c. Review the methods for solving exponential equations using logarithms.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

Nuclear medicine technologists and nuclear physicians use radioactive isotopes of many chemicals to help diagnose disease and to treat disease. One example is the use of radioactive isotopes of iodine to diagnose hyperthyroidism, hypothyroidism, and enlargement of the thyroid. A second example is the use of radioactive thallium for locating the location and size of a myocardial infarction, checking a false positive exercise test, and screening patients who might require bypass surgery. Many people are hesitant about the introduction of any radioactive substance into their bodies. We will use exponential decay graphs with data concerning isotope amounts and half-lives to calculate the length of time the radioactive substance remains in the body.

NUCLEAR MEDICINE AND MATHEMATICS

I. In calculating dosages for the use of radioactive isotopes, the curie, Ci, will be used. One curie corresponds to 3.7×10^{10} disintegrations/sec. As the substances decay, the number of disintegrations/sec will be reduced. The usual measure for measuring decay for radioactive substances is the half-life. One half-life is the length of time required for one-half of the substance to change into a new isotope. For the isotope of iodine, ^{131}I, the half-life is 8.1 days. The radioactive isotope decays exponentially. The general form of the function is $A(t) = A_0e^{-kt}$ where A_0 is the original amount of isotope present at time, $t = 0$ and k is the radioactive decay rate. The sign of k is negative because there is a decrease in amount.

Calculations

1. Work in groups of 3-4 students. Let us write the exponential function that will describe the decay of ^{131}I. After 8.1 days, only one-half of the original amount of ^{131}I will be left. Represent this amount by $\frac{1}{2}A_0$. Substitute $A = \frac{1}{2}A_0$ and $t = 8.1$ into the general form of the radioactive decay function. Solve for k.

At $t = 0$, the patient will receive 30 mCi of ^{131}I solution to help diagnose a thyroid abnormality. ($m = 1 \times 10^{-6}$) Use 30 mCi as A_0 and write the general function describing the decay of ^{131}I.

2. Graph the function (by hand or by using a graphing calculator) that you developed in Calculation 1. Use an appropriate window that would allow you to watch the decay over at least 4 half-lives. Sketch the graph indicating the window used.

4. Integrated Learning Activity (continued):

Questions

1. The patient has measurements taken after 2 hours, after 8 hours and then after 24 hours. Use your function to calculate the mC of ^{131}I present at each time. (Hint: The times must be measured in days.)

2. Check the values calculated in Question 1 graphically.

3. Find the length of time it would take for the ^{131}I concentration to drop to 10 mC. How long to drop to 1mC? Use both algebraic and graphical methods.

II. The isotope of thallium, ^{201}Tl, has a biological half-life of 30 seconds. (A biological half-life measures how long it takes for the system to either metabolize or remove one-half of the isotope from the system while a physical half-life measures the amount of time for one-half of the substance to change into another isotope.) It physically decays with a half-life of 73.1 hours to a mercury isotope, ^{201}Hg that is stable. The mercury emits photons of energy that are measured during testing. When thallium is administered, the heart absorbs about 4-5% of the thallium and a maximum concentration is reached in about 10 minutes. Testing is done when the patient is under stress to find out whether there is sufficient blood supply to the heart when a resting test does not indicate problems. Stress is induced through exercise on a treadmill or on an exercise bicycle. The isotope is administered when the patient is at the maximum stress level and exercise is continued for at least 30 seconds afterward. The usual dose is 1.5- 2 mCi/ 70kg (about 154 pounds). Measurements are begun within 5-10 minutes after injection and should be finished within 30-40 minutes.

Calculations

1. Use the methods in I, Calculation 1 to write an exponential decay function for thallium. Use 1.5 mCi as the initial concentration and 73.1 hours for the half-life. Note: $m = 1X\ 10^{-3}$.

2. Write a new function describing only the decay in the heart. Assume 5% of the initial dose is found in the heart.

3. Graph the functions in 1 and 2 showing at least 4 half-lives.

4. Integrated Learning Activity (continued):

Questions

1. How much thallium would be left in the body(in mCi) when the technologist began readings after 10 minutes? after 40 minutes?

2. How much thallium would be left in the heart after 10 minutes? after 40 minutes?

3. How long would it take for the amount of thallium in the body to drop to 2% of the original amount? How long for the amount in the heart to drop to 2%? How do the two values compare?

Extensions

1. Choose either thyroid disease or heart disease and write a two-page paper on the symptoms, testing that requires radioisotopes, and treatment.

2. Write a 2-page paper on the uses of radioisotopes for determination of the age of the earth or of organic substances.

C. Assessment:

A completed written report may be used for assessment. Students may also give oral reports using the overhead projector to illustrate the graphs. Students should be able to write an exponential function given the original amount of a substance and its half-life.

5. Instructor Resources/References:

a. TI-82 Manual (or other calculator manual)
b. TI-Graph Link manual
c. Intermediate Algebra text
d. *Nuclear Medicine Technology and Techniques*, Bernier, Langan, Wells, editors, 1981,C.V. Mosby Company
e. *Technology and interpretation of Nuclear Medicine Procedures*, Sodee and Early,1975, C.V. Mosby Company

6. Integration of Technical/Academic Courses:

This topic integrates health, biology, and chemistry with mathematics by working with nuclear isotopes used currently for diagnostic work.

7. Developed by:	**Date Developed/Revised:**
Judith M. Jones	December, 1995

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Integrated Curriculum Activity
# M-23

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Business, Financial Services

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will solve and use exponential or logarithmic equations involving integer exponents only.
c. The student will solve verbal problems which will require exponential or logarithmic equations for solutions.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper
b. Worksheet
c. Scientific calculator

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing
b. Review the meaning of domain and range.
c. Review the methods for solving linear equations.
d. Review the form for exponential expressions and equations
e. Review the methods for solving exponential equations.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

In this activity, students are given a nonlinear equation which is used to determine the growth of a savings account. The students first complete example problems. Next, they complete two graphing assignments based on the formula and determine which variable causes a linear relationship and which variable creates a nonlinear (exponential) relationship. Students are also questioned on domain and range. This activity would be a good lead-in intoexponential or logarithmic functions.

A PENNY SAVED

Money grows in a savings account, even without deposits, because of interest. The formula below is used to determine the new balance of a savings account after interest has accumulated for an amount of time.

$$B = P(1 + i)^n$$

B = new balance after interest
i = monthly interest rate (in decimal form)
n = number of months
P = original principal in account

1. Use the above formula to complete the following problems:

a. How much would you have in a savings account after 5 years if you initially deposited $10,000, got an average interest rate of 3% APR (annual percetage rate), and made no further deposits? (Hint: You want a monthly interest rate so divide the APR by 12.)

b. How much would you have in a CD (certificate of deposit) after 5 years if you initially deposited $10,000, got an average of 6% APR, and made no further deposits?

c. How much would you have in a stock fund after 5 years if you initially deposited $10,000, got an average APR of 20%, and made no further deposits?

d. How much more would you have in the 20% stock fund than in the 3% savings account after 20 years?

4. Integrated Learning Activity (continued):

e. How long would it take to double an initial $5000 investment in a mutual func that averages 8% APR?

2. Rewrite the formula with a constant APR of 12.5%, a time period of 10 years, and a variable original deposit.

3. Graph the equation you have written from problem 2.

4. What is the relationship between the new account balance and the original deposit with a constant interest rate and constant period of time?

5. What is the domain of the relation from problem 2? (Remember which values for P are realistic.)

6. What is the range of the relation from problem 2?

7. Rewrite the original formula with a constant APR of 12.5%, an original principal of $3000, and a variable period of time.

8. Graph the equation you have written from problem 8

9. What is the domain and range for the equation you just graphed? Verify your answer by checking your graph. (HINT: Remember which values of n can realistically be placed in the formula!)

10. What type of relationship is displayed in the graph from problem 9?

C. Assessment:

This activity may be assessed by collecting the handouts and grading them for accuracy or by having the student write a summary of the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. Intermediate algebra text

6. Integration of Technical/Academic Courses:

This activity relates algebra to business and finance applications.

7. Developed by:	**Date Developed/Revised:**
Melissa Pedone	December, 1995

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Integrated Curriculum Activity
# M-24

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Biology, Business, Financial Services, Environmental Science

3. **Topic/Competency/Goal:**

    a. The student will perform appropriate algebraic operations to solve equations.
    b. The student will solve exponential equations using rational exponents.
    c. The student will calculate values using the y^x.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Calculator

2. Preparation for Activity/Prerequisite

a. Review the properties of exponents.
b. Review the methods for solving exponential equations.

B. Description of Integrated Learning Activity

The population formula can be used to predict future growth of various areas. Given a previous population, the current population, and the number of years difference, we can calculate the percentage of growth. This could be useful to city planners, state and local government agencies, and businesses in determining expected future populations. The following worksheet provides a formula to be used in predicting population growth.

4. Integrated Learning Activity (continued):

POPULATION WORKSHEET

The latest population can be calculated using the formula

$$y = y_0(1 + r)^n$$

where y_0 is the original population, r is the growth rate per year (written as a decimal) and n is the number of years. Use the formula to solve the following problems. Show your work.

1. Find the annual growth rate for the United States if the population increased from 3,900,000 in 1790 to 250,000,000 in 1990.

2. What would be the annual growth rate for Orange County Florida if the population increased from 471,016 in 1980 to 677,491 in 1990?

3. You need information about the estimated number of tourists visiting Florida in the coming years. In 1980, there were 25,987,348 tourists visiting Florida and in 1985, the number grew to 32,217,205.

   a. Find the average annual percentage increase in the number of visitors.
   b. Calculate the expected number of tourists for 1986, 1987 and 1988.

4. If Florida's population increased from 6,791,418 in 1970 to 9,746,324 in 1990, what was the average annual percent increase in population?

5. From 1900-1988 both Los Angeles and New York City increased in population by over three million people. Determine which city's average annual growth rate (in percent) was higher.

City	Population in 1900	Population in 1988
New York	3,500,000	7,352,700
Los Angeles	102,000	3,352,710

Extension

Find population information on your city and determine the average annual percent of increase over the last ten years. Then calculate the population for the next five years assuming growth will remain steady.

4. Integrated Learning Activity (continued):

C. Assessment:

Students should complete worksheet. Students could write a brief report from the extension. A question requiring students to use this formula could be included on a test of solving exponential equations.

5. Instructor Resources/References:

1. *The Florida Handbook 1991-1992*
2. *Compton's Interactive Encyclopedia*
3. Merrill *Integrated Math Course 3*

6. Integration of Technical/Academic Courses:

This activity relates the topic of population growth to business and environmental science to the algebraic topic of exponential equations.

7. Developed by:	**Date Developed/Revised:**
Kevin Kugler	December, 1995

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Integrated Curriculum Activity
# M-25

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Geometry, Industrial Engineering, Chemistry, Environmental Science

3. **Topic/Competency/Goal:**

a. The student will perform appropriate algebraic operations to solve equations.
b. The student will solve and use quadratic equations.
c. The student will analyze and solve verbal problems algebraically using quadratic equations or inequalities containing one variable.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Worksheet
b. Calculator

2. Preparation for Activity/Prerequisite

a. Review the methods for solving quadratic equations.
b. Review the formulas for finding areas of rectangles.

B. Description of Integrated Learning Activity

In this activity, students are given a real-world situation which is based on a problem from CORD's *APPLIED MATHEMATICS* Unit 25, exercise 12, a situation involving a safety engineer at a chemical manufacturing plant. It requires the student to interpret a verbal problem, draw a diagram, represent the diagram as a quadratic equation, manipulate the equation into the form $ax^2 + bx + c = 0$, solve using the quadratic formula, recognize a meaningless solution, and formally state the solution.

4. Integrated Learning Activity (continued):

SAFETY ZONE

Use the situation described below to complete this handout:

A safety engineer has been contracted by a chemical company to design a waste holding area for their chemical waste. The waste holding area is to be located on a rectangular lot which measures 200 yds by 75 yds. According to EPA requirements, the rectangular holding area must be 10,000 square yards and there must be a "safety zone" of uniform width around the perimeter of the waste holding area.

1. Sketch a diagram below which represents this problem. Label the sketch with the measurements from above.

2. Let w represent the uniform width of the safety zone. Write an algebraic expression to represent the length of the interior waste holding area in terms of w and the overall length of the lot.

3. Write and algebraic expression to represent the width of the interior waste holding area in terms of w and the overall width of the lot.

4. Write an equation for the area of the waste holding area, using the specified area of 10,000 square yards and the product of the length and width as written in problems 2 and 3.

5. Multiply and simplify terms in your equation to arrive at a quadratic equation in the form $ax^2 + bx + c = 0$.

6. Identify a, b, and c from your equation.

7. Use the quadratic formula to determine the width (w) of the safety zone which makes your equation true.

8. Are both solutions to the quadratic equation realistic answers the original problem?

4. Integrated Learning Activity (continued):

9. Explain why one of the answers cannot be used as a solution to the original situation.

10. Use the realistic answer to give the necessary dimensions for the inner waste holding area.

C. Assessment:

This activity may be assessed by collecting the handouts and grading them for accuracy or by having the student write a summary of the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. Intermediate algebra text

b. CORD's *Applied Mathematics*, Unit 25, exercise 12

6. Integration of Technical/Academic Courses:

This activity relates algebra and geometry to industrial and environmental technology.

7. Developed by:	**Date Developed/Revised:**
Melissa Pedone	December, 1995

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Integrated Curriculum Activity
# M-26

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Drafting and Design

3. **Topic/Competency/Goal:**

   a. The student will perform appropriate algebraic operations to solve inequalities
   b. The student will calculate the mean and standard deviation.
   c. The student will analyze tolerance intervals
   d. The student will construct histograms

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   a. 10 large machine bolts
   b. Vernier calipers
   c. Graphing calculator
   d. Micrometer

   2. Preparation for Activity/Prerequisite

   a. Review basic operations of graphing histograms.
   b. Review mathematical concepts in linear inequalities.
   c. Review calculation of mean and standard deviation.
   d. Review use of calipers.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

Most products include tolerances in their specifications. The target thickness is given but there is some allowance for variation. This gives a range of acceptable thicknesses.

SAMPLING THE QUALITY OF A PRODUCT

Problem: You will measure the dimensions of a sample of bolts. Then, based on your measurements, you will write inequality statements as they relate to tolerances and specifications.

Procedure:

1. Use the micrometer to measure and record the head width of each of the 10 bolts. Record on the table in part 2.

2. Use the Vernier calipers to measure and record the overall length of each of the 10 bolts. Record in the table below. Calculate the mean and standard deviation.

Bolt	Head width (inches)	Overall length (centimeters)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Mean head width: Mean overall length:

Standard deviation: Standard deviation:

4. Integrated Learning Activity (continued):

3. Use your data to write inequality statements for the distribution of your measured data.

- a. A greater than relationship for the head width
- b. A less than relationship for the head width.
- c. A combined inequality for the head width.
- d. A greater than relationship for the overall length.
- e. A less than relationship for the overall length.
- f. A combined inequality for the overall length.

4. If you worked in quality control for a company, you may be involved in establishing tolerances for a production process. You sample the product, as you did above, and you recommend a tolerance for the machine or process. One way to show a tolerance is to report the mean plus or minus 2 standard deviations ($\bar{x} \pm 2\sigma$). Substitute your values for the mean and standard deviation and show a tolerance for the:

head width: ____________ & ____________

overall length: ____________ & ____________

5. Rewrite your tolerance as a combined inequality statement for:

head width ________________________________

overall length: ________________________________

6. Draw or show on a graphing calculator two histograms, one for the head width and one for the overall length.

7. Show your combined inequalities in problem 5 on the horizontal axes of your graphs.

8. Do any of your bolts' measurements fall outside the tolerance interval you found in problem 5. Which ones?

C. Assessment:

Completion of the activity will be evaluated to measure the student understanding of mathematical and statistical applications to manufacturing.

5. Instructor Resources/References:

a. Algebra texts
b. CORD's *Applied Mathematics*

6. Integration of Technical/Academic Courses:

This application is used to demonstrate the use of manufacturing tools and how inequalities and statistics play a role not only mathematically but graphically.

7. Developed by: **Date Developed/Revised:**

Ninette May December, 1995

Valencia Community College
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Integrated Curriculum Activity
M-27

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Aeronautics, Engineering Technology

3. **Topic/Competency/Goal:**

   a. The student will perform appropriate algebraic operations to solve equations.
   b. The student will write an equivalent equation by taking the logarithms of both members of a given equation.
   c. The student will calculate values using the ln x and y^x or e^x keys on a calculator.

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   a. Graph paper (for extension only)
   b. Calculator

   2. Preparation for Activity/Prerequisite

   a. Review the properties of logarithms.
   b. Review the methods for solving exponential and logarithmic equations.

4. **Integrated Learning Activity (continued):**

   B. Description of Integrated Learning Activity

A radioisotopic power supply for a satellite is determined as a function of time. The duration of the satellite's usefulness can be determined by the amount of the original isotope provided. The following page could be used as a handout.

4. Integrated Learning Activity (continued):

SATELLITE POWER SUPPLY WORKSHEET

The power output in watts from the radioisotope is given by the equation

$$P = 50\,e^{t/250}$$

where t is the time in days and e is the base of natural logarithms.

Use the equation above to solve the following problems. Show your work.

1. How much power will be available at the end of one year?

2. What is the half-life of the power supply? In other words, how long will it take for the power to drop to half its original strength?

3. The equipment aboard the satellite requires 10 watts of power to operate properly. What is the operational life of the satellite?

4. How much isotope would be needed if the satellite's mission lasted 2 years? Let x replace 50 in the original equation.

5. An outside company wants to add an experiment to the satellite's payload that would require an additional 5 watts of power. How much additional isotope would be required to provide power for 2 years?

Extension

Graph the power output, starting g at t = 0. Where would be a good ending point for the graph? To help determine how far to make the graph, decide how low you want to allow the power (measured in watts) to get. Some values that may help you make the decision are listed below.

t = 576 days	P = 5 watts
t = 978 days	P = 1 watt
t = 1151 days	P = 0.5 watt
t = 1554 days	P = 0.1 watt

4. Integrated Learning Activity (continued):

C. Assessment:

Students should complete the activity for one form of assessment. A related question on natural logarithms should also appear on a test of this material.

5. Instructor Resources/References:

1. NASA book
2. Intermediate Algebra text

6. Integration of Technical/Academic Courses:

This activity relates science and technical fields directly to the algebraic calculations of logarithms.

7. Developed by:	**Date Developed/Revised:**
Kevin Kugler	December. 1995

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Integrated Curriculum Activity
# M-28

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Health, Biology, Chemistry

3. **Topic/Competency/Goal:**

   a. The student will perform appropriate algebraic operations to solve equations.
   b. The student will solve and use quadratic equations.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Graph paper
b. pH test paper sensitive to 0.1
c. Candy
d. Graphing calculator
e. Worksheets

2. Preparation for Activity/Prerequisite

a. Review basic operations of graphing for the graphing calculator.
b. Review the form for quadratic expressions and equations.
c. Review the methods for solving quadratic equations.
d. Review the method for using pH paper.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

In this activity, students use a quadratic formula to investigate how pH levels change in our mouths after we eat sweets. Students first do some initial calculations on the formula itself. These calculations involve manipulating the formula, using it to calculate the acid levels for specific time intervals, and then graphing the formula. Students are also required to make some inferences about their results. Finally, students actually eat a piece of candy and collect data on pH levels to test how accurate the formula and their calculations are. They graph the results and make a conclusion based on the comparison of the two graphs.

SWEET SUCCESS
MATHEMATICS EXERCISES

Show your work for each of the problems.

When you eat something sweet it changes the acidity of your mouth. A known formula for showing the relationship between the acid level in your mouth (A) and the time in minutes after eating (t) is approximately:

$$\frac{(A - 6.5)(t^2 + 36)}{-20.4} = 1$$

1. Solve the above equation for A in terms of t.

2. Make a chart for A for values of t from t=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 70 ,80, 90, 120, 180, 720, 2160, and 8640.

3. Use the chart to sketch a graph of the equation for A. Use only the values of t=0 through t=90.

4. Describe the relationship between A and t. What happens to A as t increases?

5. In reality, will the graph ever leave the first quadrant? Explain.

6. Graph the equation for A on a graphing calculator. List the values you should input for the range below.

7. What happened to the graph? Record your observations and explanations below?

4. Integrated Learning Activity (continued):

8. Take a piece of pH test paper and find the pH level of your mouth and record below. Test your mouth by gathering some saliva on the tip of your tongue and dipping the end of the pH test paper into it.

9. Normal pH is 6.5. How much do you vary from "normal?"

10. Eat a piece of candy and test your pH immediately after you finish. (This is your reading for t=0.) Continue to test your pH levels for each of the time intervals listed below.

t=0 A=____ t=6 A=____

t=1 A=____ t=7 A=____

t=2 A=____ t=8 A=____

t=3 A=____ t=9 A=____

t=4 A=____ t=10 A=____

t=5 A=____ t=15 A=____

11. Sketch the graph of the data you collected below.

12. How does the data for the second graph compare with the calculations from your first? Explain your results.

C. Assessment:

This assignment may be assessed by collecting the worksheets and grading for accuracy, observation of technique by instructor, or having the student write a summary paper on the formulas used, their meanings, and the applications of algebra which were used.

5. Instructor Resources/References:

a. TI-82 manual (or other calculator manual)
b. TI-Graph Link manual
c. Intermediate Algebra text
d. Resources concerning pH

6. Integration of Technical/Academic Courses:

Technical courses especially in the health fields are integrated through the use of actual scientific formulas and principles in real-world word problems.

7. Developed by:	**Date Developed/Revised:**
Melissa Pedone	December, 1995

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Integrated Curriculum Activity

# M-29

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Physics, Criminal Justice

3. **Topic/Competency/Goal:**

   a. The student will calculate approximate decimal values for a radical expression using a calculator
   b. The student will solve problems with a group

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   a. Scientific or graphing calculator

   2. Preparation for Activity/Prerequisite

   a. Review basic operations calculating square roots with a calculator
   b. Review the methods for solving radical equations.

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity

The Florida Highway Patrol Homicide Division uses a radical equation to calculate the time required for a vehicle to slow to a stop using distance (d), drag factor (f), and braking efficiency (n).

We will calculate examples of the use of this equation, $t = 0.25\sqrt{\frac{d}{fn}}$, to determine:

a. the time required for a car to stop given specific conditions,
b. if failing brakes caused the driver not to stop quickly enough,
c. or the difference in distance required to stop between an old street and a new one.

The worksheet following provides the formula used and the definition for each variable. If an accelerometer is not available or convenient, a chart with the average drag factors, developed by Northwestern University can be used. A worksheet and the solutions follows.

TRAFFIC CRASH WORKSHEET

The formula below is the equation used by the Florida Highway Patrol.

$$t = 0.25\sqrt{\frac{d}{fn}}$$

t = time in seconds
d = distance in feet
f = drag factor (percent friction on the road, tested with a drag sled device, an accelerometer, where % = pull/weight)
n = braking efficiency (100% if all brakes work, subtract 30% for each front brake that fails, and 20% for each rear brake that fails)

1. Determine the time required for a car to stop due to an accident on I-75 if the distance required to stop is 200 feet, the drag factor for high speeds on an old concrete interstate during dry weather is 0.5, and all brakes work (n = 100%).

2. Calculate the distance (d) a car needs to stop within five seconds if the rear brakes fail (n = 60%, and if it is on a new city street in the rain (f = 0.75).

4. Integrated Learning Activity (continued):

3. Compare the difference in distance required to stop because of road quality. The time of 3 seconds and the braking efficiency of 100% remain constant. The difference is the drag factor. Find the difference in the distance required to stop for and old city street with f = 1.0 and a new street with f = 0.35.

4. A car needs to come to a quick stop on a worn city street while going 45 mph. If it takes 3.5 seconds to stop, calculate the different distances necessary for the car to stop on dry (f = 0.25) and wet (f = 0.35) roads if all brakes work (n = 100%).

Solutions

1. $t = 0.25\sqrt{\frac{200}{(0.5)(1)}} = 5$

It would take 5 seconds to stop the car.

2. $5 = 0.25\sqrt{\frac{d}{(0.75)(0.60)}}$

$d = 180$

It would take 180 feet to stop the car.

3. Old street

$3 = 0.25\sqrt{\frac{d}{(1.0)(1)}}$

$d = 144$

New street

$3 = 0.25\sqrt{\frac{d}{(0.35)(1)}}$

$d = 50.4$

$144 - 50.4 = 93.6$

Thus, 93.6 extra feet are required for the older street perhaps due to oil and wear smoothing the surface.

4. Dry surface

$3.5 = 0.25\sqrt{\frac{d}{(0.25)(1)}}$

$d = 49$

Wet surface

$3.5 = 0.25\sqrt{\frac{d}{(0.35)(1)}}$

$d = 68.6$

$68.6 - 49 = 19.6$

Therefore, it would take an additional 19.6 feet to stop on the identical wet surface.

4. Integrated Learning Activity (continued):

Extension

The class could discuss or write a report on the comparison of the cost of resurfacing roads to the cost of accidents that could have been prevented if the road had better surfaces.

C. Assessment:

Students should complete the worksheet. Students could write a brief report of observing a police officer as he/she uses the calculations to assess an accident. A question requiring students to use this formula could be included on a test of solution of radical equations.

5. Instructor Resources/References:

a. Scientific or graphing calculator manuals.
b. Florida Highway Patrol, Homicide Division

6. Integration of Technical/Academic Courses:

This topic integrates traffic accident calculations from criminal justice and motion equations from physics with the concept of radical equations in mathematics.

7. Developed by:	**Date Developed/Revised:**
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Integrated Curriculum Activity

M-30

1. **Discipline/Course Unit:** Mathematics/Intermediate Algebra

2. **Related Disciplines:** Algebra, Physics, Geometry, Drafting, Engineering Technology

3. **Topic/Competency/Goal:**

a. The student will analyze and solve verbal problems algebraically using linear equations or inequalities containing one or two variables

b. The student will solve problems involving ratio and proportion

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

a. Calculator
b. Worksheets
c. Blocks of wax
d. Full soft drink cans (diet and regular)
e. Aluminum foil
f. Aluminum foil
g. Marbles
h. Tape

2. Preparation for Activity/Prerequisite

a. Review methods for making orthographic drawings
b. Review the methods for solving linear equations
c. Review the methods for solving proportions

4. Integrated Learning Activity (continued):

B. Description of Integrated Learning Activity:

Students are given instructions to construct a flotation device out of a 6" by 6" piece of foil and 6 inches of tape which will support the weight of 15 marbles for one minute in a pan of water. They should work in groups and complete a three-dimensional (orthographic) drawing of the vessel complete with all dimensions before they begin construction. Once the drawing is complete they should test their model and make alterations, being sure to retake measurements when needed. After the flotation device is complete, students should complete the data worksheet which accompanies this activity which includes problems on density, volume, and pressure.

WATER CROSSING

Mathematics Exercises

Show your work for each problem

1. Complete an orthographic (3-D) sketch on a separate sheet of paper of your device with a **top** view.

2. Complete an orthographic (3-D) sketch on a separate sheet of paper of your device with a **side** view.

3. Complete an orthographic (3-D) sketch on a separate sheet of paper of your device with a **bottom** view.

4. Record the amount of water in milliliters in the beaker in the classroom.

5. Place your flotation device, including marbles, into the beaker and record the water level in milliliters.

6. Find the difference between the amount of water before the boat was immersed and while the boat was in the water (in milliliters).

7. Water weighs 1 gram for every milliliter. How much would the water weigh from problem 6?

8. An item floating in water will displace its own weight. your boat will displace an amount of water equal to its own weight. Based on your answer to problem 7, how much does your boat and contents weigh?

4. Integrated Learning Activity (continued):

9. Weigh your boat and contents on the scale and determine its actual weight

10. How does the actual weight compare to the weight from problem 8?

11. The density of water is 1 gram/cm^3. An object will float only if its density is less than 1 g/cm^3. is the density of your boat greater than or less than 1g/cm^3?

12. Density is calculated using the formula, density = $\frac{\text{mass}}{\text{volume}}$ or d = $\frac{m}{v}$. Solve this formula for m. Then solve this formula for v.

13. An object has a mass of 15 grams and a volume of 12 cm^3. What is its density?

14. Will the object float?

15. An object has a density of 2.1 g/cm^3. It has a mass of 52 g. What is its volume?

16. Find the volume of your boat. It may be necessary to do some estimating. DO ALL YOUR MEASUREMENTS IN CENTIMETERS.

17. Calculate the density of your boat using the density formula.

18. According to your calculations, should your boat have floated or sank?

19. Are your calculations accurate? Why or why not?

20. Get a block of wax from the instructor. Make a guess, will it float?

21. Measure the block in centimeters and find the volume. Use the scale to find the mass in grams and record the results.

22. use the density formula to calculate the density.

23. Based on your calculations, will the wax float? Why or why not?

24. Test your results by putting the wax in water. Were you correct?

4. Integrated Learning Activity (continued):

25. Weigh a diet soft drink can and a regular soft drink can and record the results.

26. What is the volume of a soda can? Hint: 1 milliliter = 1 cm^3.

27. Find the density of the diet soft drink can.

28. Find the density of the regular soft drink can.

29. Based on your calculations, will the cans float.

30. Put the cans in the water and check your predictions. How did you do?

31. How would you explain the results?

32. Pressure = $\frac{\text{force}}{\text{area}}$ or $P = \frac{F}{A}$. What is the force pushing downward on the boat? Hint: The downward force is the weight of the boat.

33. Calculate the area of your boat which makes contact with the water (use inches). (It may be necessary to do some estimation here.)

34. Calculate the pressure exerted by the boat on the water in gsi (grams per square inch). In an hydraulic system, such as a car jack, the pressure exerted in the downward direction equals the pressure exerted in the upward direction (P1 = P2). By substituting, Pressure = $\frac{\text{force}}{\text{area}}$ or $P = \frac{F}{A}$, we get the following proportion to calculate the forces within an hydraulic system: $\frac{F_1}{A_1} = \frac{F_2}{A_2}$

35. Describe in words what each one of the four variables represents.

36. Find F_2 if F_1 = 20 newtons, $A_1 = 0.5\ cm^2$, and $A2 = 0.1\ cm^2$.

37. Find A_1 if F_1 = 12 newtons, F_2 = 15 newtons, and $A_2 = 0.04\ cm^2$.

4. Integrated Learning Activity (continued):

C. Assessment:

This assignment may be assessed by collecting the worksheets and grading for accuracy, observation of technique by the instructor, or having the student write a summary paper on the formulas used, their meanings, and the applications of algebra which were used

5. Instructor Resources/References:

a. Intermediate Algebra text
b. Physics text

6. Integration of Technical/Academic Courses:

Technical courses in drafting and engineering technology are integrated with algebra, geometry, and physics through the use of actual scientific formulas and principles in real-world word problems as well as mechanical drawing

7. Developed by:	**Date Developed/Revised:**
Melissa Pedone	December, 1995

Science

Orange County Public Schools • Osceola District Schools • Valencia Community College

Integrated Curriculum Activity
S-1

1. **Discipline/Course Unit:** Fundamentals of Biology

2. **Related Disciplines:** Introduction to Chemistry
Elementary Algebra

3. **Topic/Competency/Goal:**
   1. Understanding of the definitions of hypertonic, hypotonic, and isotonic solutions.
   2. Understanding of how to prepare hypertonic, hypotonic and isotonic solutions.
   3. Understanding of the mathematical calculations involved in the preparation of hypertonic, hypotonic and isotonic solutions.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

   1. **Materials, Supplies, AV Equipment**
      Sodium Chloride (crystals)
      Balance
      Spatula
      Distilled Water
      Three 50 mL volumetric Flasks

   2. **Preparation for Activity/Prerequisite**
      Understand the principle of osmosis and osmotic pressure.
      Read the definitions of hypertonic, hypotonic and isotonic solutions.
      Be knowledgeable on how to prepare an isotonic solution of Sodium Chloride (0.9%)
      Calculate the amount of Sodium Chloride necessary to prepare a hypertonic solution of Sodium Chloride of a concentration of 3.0%.

B. Description of Integrated Learning Activity

This Integrated Learning Activity is designed to acquaint the students with the following chemistry concepts and materials:

Osmosis
Osmotic Pressure
% as a Unit of Concentration
Isotonic Solution
Hypotonic Solution
Hypertonic Solution
Volumetric Glassware
Volumetric Solutions

Osmosis is the tendency exhibited by water to diffuse through a semipermeable membrane. In the pharmaceutical field an isotonic solution of Sodium Chloride has a concentration of 0.9% NaCl. Solutions injected into the human body must have the same osmotic pressure as the blood serum (isotonic with blood serum). If a hypotonic solution (less concentrated than the blood serum) is injected in sufficient amounts to cause dilution of the blood serum, the water from the diluted serum diffuses into the blood cells by osmosis, causing the blood cells to expand and possibly rupture. When a hypertonic (more concentrated solution than blood serum) is injected, the cells lose water to the more concentrated solution and the red blood cells shrivel and possibly die.

In order to prepare the NaCl solutions, follow the following steps:

1. Clean three 50mL volumetric flasks.
2. Assume the density of each the solutions is comparable to the density of water of 1.00 g/mL.
3. Calculate the necessary amount of NaCl to make 50mL of each solution as follows:

$$\% \text{ solute} = \frac{\text{mass of solute}}{\text{mass of solution}} \times 100$$

therefore,

.9% NaCl Solution: $0.9 = \frac{\text{mass of NaCl (g)}}{\text{50g of solution}} \times 100$

3.0% NaCl Solution: $3.0 = \frac{\text{mass of NaCl (g)}}{\text{50g of solution}} \times 100$

0.0% NaCl Solution: Distilled Water - 50mL

4. Weigh the necessary masses of NaCl (0.45g for the 0.9% solution and 1.5g for the 3.0% solution).
5. Introduce 0.45g of NaCl into a 50mL, and rinse the paper with distilled water.
6. Add about 25mL of distilled water and use a Pasteur pipette to rinse the sides of the volumetric flask.
7. Swirl the volumetric to dissolve all the NaCl.
8. Add distilled water with the aid of a pipette to the 50mL mark making sure the meniscus of the water is read at a level to your eyes.
9. Place the glass or teflon stopper and invert the solution a few times to allow mixing, until the solution is homogeneous.
10. Follow the same procedure for the preparation of the 3.0%, but using 1.5g of NaCl instead.

C. Assessment:

Students need to be assessed according to their laboratory techniques, and their knowledge to conduct the calculations.

5. Instructor Resources/References:

Biology/Neil A. Campbell.--3rd Ed. ISBN 0-8053-1880-1
The Benjamin/Cummings Publishing Company, Inc.
Redwood City California 94065

General Chemistry/Henry F. Holtzclaw, William R. Robinson,
Jerome D. Odom.--9th Ed. ISBN 0-669-24429-5
D. C. Heath, Lexington, MA 02173

6. Integration of Technical/Academic Courses:

This unit is a direct application of the analytical practices used to prepare volumetric solutions, while at the same time including terminology and concepts used in the medical field. The unit brings together the disciplines of mathematics, biology and chemistry.

7. Developed by: **Date Developed/Revised: December 1995**

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Orange County Public Schools • Osceola District Schools • Valencia Community College

Integrated Curriculum Activity
S-2

1. **Discipline/Course Unit:** Fundamentals of Biology

2. **Related Disciplines:** Introduction to Chemistry

3. **Topic/Competency/Goal:**
   1. Understanding of the definitions of hypertonic, hypotonic, and isotonic solutions.
   2. Understanding of the basic parts of the microscope.

4. **Integrated Learning Activity:**

   A. Student Preparation

   1. Materials, Supplies, AV Equipment

   Isotonic Solution of NaCl, 0.9% NaCl
   Hypertonic Solution of NaCl, 3.0% NaCl
   Hypotonic Solution of NaCl, 0.0% Nacl
   Microscopes
   Slides and Cover
   Elodea, Green Algae
   Pipettes

2. Preparation for Activity/Prerequisite

Understand the principle of osmosis and osmotic pressure.
Read the definitions of hypertonic, hypotonic and isotonic solutions.
Be knowledgeable on how to prepare an isotonic solution of Sodium Chloride (0.9%).
Calculate the amount of Sodium Chloride necessary to prepare a hypertonic solution of Sodium Chloride of a concentration of 3.0%.
Know how to work with the available microscope.

B. Description of Integrated Learning Activity:

The main object of this activity is to acquaint the students with the effect of Isotonic, Hypertonic, and Hypotonic solutions on a piece of Elodea Algae. This Integrated Learning Activity is designed to acquaint the students with the following chemistry and biology concepts and materials:

Osmosis
Osmotic Pressure
% as a Unit of Concentration
Isotonic Solution
Hypotonic Solution
Hypertonic Solution

Osmosis is the tendency exhibited by a solvent to diffuse through a semipermeable membrane, from a less concentrated to the more concentrated side of the membrane. Membranes that allow the passage of solvent particles but not solute are called semipermeable membranes.

Osmotic pressure is the pressure required to stop the passage of solvent molecules through a semipermeable membrane. In the pharmaceutical field an isotonic solution of Sodium Chloride has a concentration of 0.9% NaCl. Solutions injected into the human body must have the same osmotic pressure as the blood serum (isotonic with blood serum). If a hypotonic solution (less concentrated than the blood serum) is injected in sufficient amounts to cause dilution of the blood serum, the water from the diluted serum diffuses into the blood cells by osmosis, causing the blood cells to expand and rupture. When a hypertonic (more concentrated solution than blood serum) is injected, the cells lose water to the more concentrated solution and the red blood cells shrivel and possibly die.

In order to conduct the activity follow the following steps:

1. Cut three pieces of approximately 1mm by 1mm of a leaf of Elodea or Green Algae.
2. Prepare a microscope with a X100 magnification.
3. Place each piece of Algae on an individual slide.
4. With the help of a Pasteur Pipette add two drops of the Hypotonic solution, wait a few seconds and make a wet mount slide.
5. Follow the same procedure as in (4), but this time add two drops of the isotonic solution.
6. Follow the same procedure as in (4), but this time add two drops of the Hypertonic solution.
7. Look at the three slides through the microscope.
8. Draw the observed cells on a piece of white paper.
9. Describe and report the appearance of the three tissues in detail.

C. Assessment:

Students need to be assesed according to their laboratory techniques, and their knowledge to conduct the experiment. Student should present a concise and descriptive laboratory report.

5. Instructor Resources/References:

Biology/Neil A. Campbell.--3rd Ed. ISBN 0-8053-1880-1
The Benjamin/Cummings Publishing Company, Inc.
Redwood City, California 94065.

General Chemistry/Henry F. Holztzclaw, William R. Robinson,
Jerome D. Odom.--Ninth Ed. ISBN 0-669-24429-5
D. C. Heath, Lexington, MA 02173

6. Integration of Technical/Academic Courses:

This unit is a direct application of the definitions for osmosis, while at the same time including terminology and concepts used in the medical field. The unit brings together the disciplines of biology and chemistry.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
S-3

1. **Discipline/Course Unit:** Biology

2. **Related Disciplines:** Horticulture; Botany; Anatomy & Physiology

3. **Topic/Competency/Goal:** Relation of structure to function

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Two Oyster plants
         Clear nail polish

      2. **Preparation for Activity/Prerequisite**

         View stomata on oyster plants under microscope
         Read/discuss role of stomata

B. Description of Integrated Learning Activity

Cover the upper surface of the leaves of one plant with clear nail polish.
Cover the lower surface of the leaves of the other plant with nail polish.
Observe each plant for the next few days.

C. Assessment:

What do you predict will happen to each plant?
Give support for your predictions.
How do plants take in carbon dioxide?
How do plants lose water?
Predict, with support, the results of a starch test performed on the plants.

This activity supports the development of critical thinking in relating specific structures to specific functions and how altering one can affect the other.

5.	**Instructor Resources/References:**
6.	**Integration of Technical/Academic Courses:**
7.	**Developed by:** **Date Developed/Revised: December 1995** Deborah Green, Ph.D Ron Stoesz, M.S. Tim Grogan, M.S.
	Valencia Community College **P.O. Box 3028** **Orlando, FL 32802**

Integrated Curriculum Activity
S-4

1. **Discipline/Course Unit:** Biology

2. **Related Disciplines:** Nutrition, Horticulture, Landscape Architecture

3. **Topic/Competency/Goal:** To show that PHS does result in glucose formation

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Geranium plant

2. Preparation for Activity/Prerequisite

Read/discuss the role of light in photosynthesis and glucose production

B. Description of Integrated Learning Activity

Cover several leaves completely with aluminum foil.
Place plant in sunny location for 2 days.
Perform starch test on covered and uncovered leaves.

Starch test:
- Boil leaves in alcohol (use double-boiler) to remove green color (chlorophyll)
- Remove leaves, blot dry, place in petri dish
- Drop iodine (KI) onto leaves: Dark indicates starch is present

C. Assessment:

Why did the covered leaves show no starch being present?
What natural environmental conditions would produce similar results?
Design an experiment to test what affect different amounts of light have on starch production.

This activity develops critical thinking in how plants respond to various levels of light.

5. **Instructor Resources/References:**

6. **Integration of Technical/Academic Courses:**

7. **Developed by:** **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity

#__S-5__

1. **Discipline/Course Unit:** Biology

2. **Related Disciplines:**
Nutrition
Horticulture
Anatomy & Physiology

3. **Topic/Competency/Goal:** Students will model the enzymatic production of glucose in the Calvin Cycle.

4. **Integrated Learning Activity:**

A. Student Preparation

1. Materials, Supplies, AV Equipment

Large, flat, table with chairs for seven people
Box of large plastic toothpicks, about 3 inches, or other skewers
Twenty five very small potatoes (new potatoes) (representing carbons) arranged as follows:
  a. five skewered molecules with 5 small potatoes (C) each + 2 radishes (phosphate) (represent RuBP)
  b. 6 additional single potatoes (carbons)
Bag of large marshmallows (representing H's carried by NADPH)
  Strawberries or other small fruit or vegetables may be substituted.
Bag of radishes (representing phosphates carried in ATP)
Paper sign saying "Rubisco"

2. Preparation for Activity/Prerequisite

Depending on inclination of instructor, students may be introduced to the Calvin Cycle from the text before this activity. Students will benefit by having a textbook nearby as they perform the activity. Students should be aware of what the three food items represent: carbons are potatoes, phosphate groups are radishes, H's are marshmallows.

Options: Tinker toy blocks may be substituted for food items.

B. Description of Integrated Learning Activity:

Students are seated around table. All materials are laying on the table. Materials should not be arranged in any particular order. Each student is given an instruction card or students can read from this instruction sheet and should continue to do the instructions on his/her card as long as the appropriate materials are available on the table.

1. "Rubisco student joins a single potato, with no marshmallows, to a 5-potato chain with 2 radishes.
2. Enzyme A students break 6-potato chains with 2 radishes into two 3-potato chains, each with one radish.
3. Enzyme B students attach a radish to 3-potato chains that do not have a marshmallow attached; the radish is taken from the ATP molecules.
4. Enzyme C students exchange a marshmallow for a radish on 3-potato chains that have 2 radishes attached; the removed radish is placed on the table.
5. Enzyme D students attach two 3-potato chains together; each 3-potato chain must have one radish and one marshmallow.
6. Enzyme E student takes a 6-potato chain with 2 radishes and 2 marshmallows, and places both marshmallows on one potato without a radish and removes that 2-marshmallow potato from the chain (leaving the 5-potato chain whole); the single potato is placed on the table.
7. Enzyme F student attaches single 2-marshmallow potatoes together until a chain of six is reached.

C. Assessment:

Which of the enzymes is necessary for the successful manufacture of the "glucose" molecule?

How could you tell if Enzyme C was missing?

Where does the plant get the "marshmallows" (hydrogens) and "radishes" (phosphates)? What could interfere with these being available?

What would happen if there were more of each kind of enzyme working at the same time?

This activity helps students grasp the concept of a collection of enzymes working to make an end product. It also helps students think critically about how individual parts of the process affect the whole.

5. Instructor Resources/References:

Campbell, Neil 1996 Biology. 4th ed. ISBN 0-80531940-9
The Benjamin Cummings Publishing Company, Inc.
Redwood City, CA 94065

6. Integration of Technical/Academic Courses:

Virtually all terrestrial and aquatic food chains begin with the synthesis of sugars in the Calvin Cycle. This lab involves students in understanding this critical process.

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
S-6

1. **Discipline/Course Unit:** Biology

2. **Related Disciplines:** Research, art/graphic design, computer skills, public speaking

3. **Topic/Competency/Goal:** Students will use information gathered from class lecture, observation, and research to design an imaginary fish. At the completion the students will have:
    - researched characteristics of fish
    - increased knowledge of general characteristics and terminology pertaining to living things
    - increased drawing skill through drawing and constructing a 3-D model
    - presentation experience, having the opportunity to use Powerpoint/Claris slide show/ Hyperstudio

4. **Integrated Learning Activity:**

    A. **Student Preparation**

    1. **Materials, Supplies, AV Equipment**

        To be determined by students

    2. **Preparation for Activity/Prerequisite**

B. Description of Integrated Learning Activity:

In your lab groups you are going to design your own fish. Please note that this fish does not exist. Do not copy a real organism. You will begin by doing the following:

1. Determine in what class the fish will belong
2. Size
3. Habitat
4. Coloration
5. Shape
6. Fins (Shape, Color, Number)
7. Prey

You will also need to write information about the fish in general. It needs to include:

1. How they breath
2. How they swim
3. Scales
4. How they keep afloat
5. Skeleton
6. Reproduction
7. Name each fin and its function
8. Internal anatomy
9. Nervous system
10. Circulatory system

Design your fish on paper. Once you have done this, you will build your fish out of any type of material. Your fish will be 3-D.

After constructing your fish, you will present your fish to the class, presenting all information requested.

BE CREATIVE! You may wish to use some form of technology in your presentation.

C. Assessment:

The final product will be assessed according to how well the project criteria are met. This project gives student leeway for imagination. Accuracy need only be met by the assignment directions. Phases for assessment might include:

1. rough draft
2. final design
3. data concerning the fish
4. 3-D model
5. oral presentation with special credits to those who use a form of technology (presentation software, video of fish feeding, or video of fish in "native" habitat, etc.)

5. Instructor Resources/References:

Sources of assistance, information, resources, materials, etc. for students:

Library for reference materials such as field guides for identification of fish

Museum of Natural History - Gainesville

Local fishermen

Local college professors of fresh water biology or marine biology

6. Integration of Technical/Academic Courses:

Art/graphic design:	Drawing and constructing a 3-D model
Computer skills:	Presentation using Powerpoint/Harvard Graphics/etc.
Video production:	Presentation using video material
Public speaking:	Presentation of what has been developed and produced

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#__S-7__

1. **Discipline/Course Unit:** Chemistry for Everyday Living

2. **Related Disciplines:**
Chemistry
Mathematics
Biology

3. **Topic/Competency/Goal:**
Students will analyze a soil sample of unknown origin using observational and chemical analysis.
To discover the properties and characteristics of a specific soil sample
To use mathematics to determine percentages in moisture content and moisture capacity.
To apply the results of the activity to real-life situations.

4. **Integrated Learning Activity:**

A. **Student Preparation**

1. **Materials, Supplies, AV Equipment**

Soil Sample
Water
LaMotte Test Kits
Triple Beam Balance

2. **Preparation for Activity/Prerequisite**

B. Description of Integrated Learning Activity:

NOTE: Place all results in the correct space on the data table.

PROCEDURE: PART 1 - OBSERVATIONS OF PHYSICAL CHARACTERISTICS

1. Observe your soil sample. What is its color?

2. There are some general relationships with regard to color and soil conditions.

SOIL CONDITION	DARK	MODERATELY DARK	LIGHT
Amount of Organic Matter	High	Medium	low
Erosion Resistance	High	Medium	low
Aeration	Excellent	Good	low
Available Nitrogen	Excellent	Good	low
Fertility	Excellent	Good	low

3. Rub the soil between your fingers. If it is a sandy soil, you will be able to feel the sand grains. If it is a clay soil, it will feel powdery. If you think it is a clay soil, wet your fingers and rub some soil between them. A clay soil will feel slippery. What type of soil do you have?

4. What horizon was this soil taken from? How can you tell?

PROCEDURE: PART 2 - SOIL pH

1. Many materials are classified as either acidic or basic. Some materials are neutral. Chemically, soil is acidic or basic. This chemical quality may limit or influence the vegetarian growing in it or the animals that live in it. Most plants require a pH of 6.0 - 8.0.

2. Obtain the pH test kit. Follow the directions within the kit to determine the pH of your soil sample. Record the results in the data table.

PROCEDURE: PART 3 - MOISTURE CONTENT OF SOIL

NOTE: Do not discard the soil after this procedure. It will be used in Procedure 4.

1. Determine the mass of an aluminum can. __________g.
2. Measure out at least a 200 gram sample of your soil into the can.
3. Determine the mass of the soil to be dried. __________g.
4. Place the can and soil into the drying oven for 24 hours.
5. Determine the mass of the can and the dry soil after 48 hours. __________g.
6. What is the mass of the dried soil? __________g.
7. Determine the mass lost by drying. __________g.
8. Calculate the percent of moisture by using the following formula:

$$\% \text{ Moisture} = \frac{\text{Loss of mass due to drying}}{\text{Original mass of soil}} \times 100$$

9. Record your results in the data table.

PROCEDURE: PART 4 - MOISTURE CAPACITY OF SOIL

1. Place a small hole in the bottom of the aluminum can from Procedure 3. Leave the dried soil in the can.
2. Place the can into a pan of water overnight.
3. Remove the can from the water, place it onto paper towel and allow it to drain for 30 minutes.

4. Wipe the can dry and determine the mass of the wet soil and the can. __________g.

5. Determine the amount of mass gained by soaking. __________g.

6. Use the following formula to determine the moisture holding capacity of your soil.

Percent moisture-holding Capacity = Gain in mass after immersion (Step 5) / Mass of dried soil (Step 7 procedure 3) X 100

7. Record your results in the data table.

PROCEDURE: PART 5 - NITRATE TEST (NITROGEN LEVEL)

1. Obtain the nitrogen test kit.

2. Follow the directions included in the kit and record the results in the data table.

PROCEDURE: PART 6 - PHOSPHORUS TEST

1. Obtain the phosphorus test kit.

2. Follow the directions included in the kit and record the results in the data table.

PROCEDURE: PART 7 - POTASSIUM TEST

1. Obtain the potassium test kit.

2. Follow the directions included in the kit and record the results in the data table.

PROCEDURE: PART 8 - ORGANIC MATTER IN THE SOIL

1. Obtain the humus test kit.

2. Follow the directions included in the kit and record the results in the data table.

PROCEDURE: PART 9 - CALCIUM TEST

1. Obtain the calcium test kit.
2. Follow the directions included in the kit and record the results in the data table.

PROCEDURE: PART 10 - SOIL TEXTURE CLASSIFICATION

1. Obtain the test kit for soil texture classification.
2. Follow the directions included in the kit and record the results in the data table.

PROCEDURE: PART 11 - SOIL INSECTS

1. Observe your soil sample for the evidence of any insects. Identify those found by different species.
2. Record the results in the data table.

SOIL LAB CONCLUSIONS

1. Look at the results from Procedure 1 and the estimates you made regarding soil quality. Compare these estimations with the actual results obtained from Procedures 2 - 11.
2. Is the pH test you did qualitative or quantitative? (Qualitative tests are descriptive, quantitative tests are recorded as numbers.)

   ____

   Which type of test is most effective? ______________
   Explain your answer.
3. Many people have to add lime to their fields before planting crops. This chemical reaction raises pH because lime is a base. Pine trees grow well in acidic soil. Would people who grow pine trees add lime to their tree fields? Explain your answer.

4. Pine needles are an acid producer as they accumulate and decay on a forest floor. Why is this factor important in making the floors of pine tree forests bare of vegetation?

5. If rainfall is adequate, the amount of plant growth will vary as the amount of nitrates in the soil varies.

   A. The formula for nitrate is NO_3. What two elements are present in nitrates?

   ________________ ________________

   B. What element is present in protein that is not present in fats or carbohydrates?

   ____

   C. How does a plant get protein? ________________

   D. Where does a plant get its supply of nitrate to make protein? ________________

6. Was your analysis for nitrate qualitative or quantitative? ________________ Explain your answer.

7. Phosphorous is present in the energy molecule and in DNA and RNA. If this mineral is missing, the growth processes would be slowed down. Would your soil sample promote growth activities? ______________ Explain your answer.

8. Fertilizers are frequently added to soils. What is fertilizer?

9. Compare the results of the two soil texture tests you performed.

10. For proper growth and activities of most soil organisms, the water content should be about 70% of the moisture holding capacity. If the soil has less than 60%, the water is insufficient for the needs of the organisms. If the water content is greater than 80%, the water fills too many pore spaces and limits the amount of air in the soil. Compare the water content of your soil with the water holding capacity. Is it sufficient for soil organisms and their activities? Explain your answer.

11. Would your soil sample be a good medium for plant growth? ______________ Explain your answer.

12. Explain what is meant by soil being a limiting factor in the environment.

13. Explain why a soil rich in humus would likely be resistant to erosion.

14. Discuss why a soil that is light in color would likely have low fertility.

15. What horizon is your soil sample from? ________________ How do you know?

SOIL LABS - DATA TABLE

COLOR ____________ SOIL TEXTURE ___________ HORIZON __________

EXPECTED RESULTS BASED ON COLOR:

AMOUNT OF ORGANIC MATTER ___________ AERATION ___________

RESISTANCE TO EROSION ____________

AVAILABLE NITROGEN ___________ FERTILITY ___________

MOISTURE CONTENT ___________

MOISTURE HOLDING CAPACITY ___________

PH ___________

NITRATE (NITROGEN) LEVEL ___________

PHOSPHORUS LEVEL ___________

POTASSIUM LEVEL ___________

HUMUS CONTENT ___________

CALCIUM LEVEL ___________

TEXTURE: %SAND ___________ %SILT ___________ %CLAY ___________
SOIL TEXTURE ___________

NUMBER OF INSECT SPECIES ___________

C. Process and Criteria for Assessing the Project:

The hands on approach allows for assessment of proper laboratory techniques. The data received must be recorded properly for correct analysis so that data entry must be done correctly. The analysis from the data received is a major part of the assessment procedure. It is important to be able to correctly analyze the information recorded to impress upon the student a direct correlation between the "doing" part of the lab and the "thinking" part.

5. Instructor Resources/References:

LaMotte Chemical Company (Supplier of test kits and information)
Hach Chemical Company (Supplier of test kits and information)
Department of Environmental Regulation
Department of Soil Technology - University of Florida

6. Integration of Technical/Academic Courses:

Data entry
Agriculture
Horticulture

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
S-8

1. **Discipline/Course Unit:** General Zoology

2. **Related Disciplines:** Biology

3. **Topic/Competency/Goal:** Students will design a perfect predator after researching predator characteristics. Students will increase knowledge of general characteristics and terminology pertaining to food chains and predator - prey relationships.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

      2. **Preparation for Activity/Prerequisite**

B. Description of Integrated Learning Activity:

PART 1: PREDATOR RESEARCH

Choose any two predators (teacher approved) and supply the following information. For any item that does not apply, write DNA. If the information is not available, write NA. Prepare to present your information using a presentation program of your choice.

COMMON NAME ______________________

SCIENTIFIC NAME ______________________

STATUS: ENDANGERED/INCREASING/DECREASING/
STABLE ____________________

NUMBER PER LITTER/NEST __________________

NOCTURNAL/DIURNAL ___________________

ADULT WEIGHT: FEMALE __________ MALE __________

WING SPAN ______________

BODY LENGTH ______________

DISTINGUISHING MARKINGS__________________________
____
____

HABITAT ____

RANGE ____

TROPHIC LEVEL _____________________
TOP CARNIVORE: YES/NO ______________

PREFERRED PREY ___________________________________

SECONDARY PREY ___________________________________

HOW DOES IT KILL __________________________________
____

EFFICIENCY (LOW, MEDIUM, HIGH) ____________________

ANY OTHER INFORMATION ____________________________
____

PART 2: PERFECT PREDATOR

No animal is 100% efficient. Most animals you researched as predators had efficiencies that were low or moderate. Your assignment is to design a perfect predator (one with an efficiency of 100%). Think of the various characteristics of animals which make them a successful predator in their environment. You may use as many different animal characteristics as necessary to make this a perfect predator. Prepare to present your perfect predator using a presentation method of your choice.

COMMON NAME ____________________________

SCIENTIFIC NAME ____________________________

STATUS: ENDANGERED/INCREASING/DECREASING/
STABLE ________________

NUMBER PER LITTER/NEST ________________

NOCTURNAL/DIURNAL ________________

ADULT WEIGHT: FEMALE ___________ MALE ___________

WING SPAN ________________

BODY LENGTH ________________

DISTINGUISHING CHARACTERISTICS ____________________
(PARTS OF ANIMALS USED) ____________________
____

HABITAT ____

RANGE ______________________________

TROPHIC LEVEL ______________________________

TOP CARNIVORE: YES/NO ______________

PREFERRED PREY ______________________________

SECONDARY PREY ______________________________

HOW DOES IT KILL ______________________________
____

EFFICIENCY (LOW, MEDIUM, HIGH) ______________________

ANY OTHER INFORMATION ______________________
____

C. Assessment:

The final product would be assessed according to 1) accuracy of research and 2) how well the project criteria were met. This project gives students leeway for imagination based on reality. Accuracy of research and the need for multiple reference materials will complete part 1. Phases for assessment of part 2 might include 1) rough draft, 2) final design, 3) data concerning the predator, 4) 3-D model, 5) oral presentation with special credits to those who use a form of technology (presentation software, video of predator hunting a prey or in "native" habitat)

5. Instructor Resources/References:

Library for reference materials such as field guides for identification of predators
Museum of Natural History - Gainesville
Video library or TV programs of predators
Art department
TV production and design studio

6. Integration of Technical/Academic Courses:

Art - Drawing and constructing a 3-D model or multiple models showing predator in action
Computer Skills - Presentation using Powerpoint/Claris slide show/Hyperstudio
Public Speaking - Presentation of what has been researched and produced

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#___S-9___

1. **Discipline/Course Unit:** Fundamentals of Biology

2. **Related Disciplines:**
Chemistry
Medical

3. **Topic/Competency/Goal:**
   1. Identify normal red blood cell morphology on a freshly prepared slide prep using light microscopy.
   2. Describe the effect of hypertonic and hypotonic solutions on RBC morphology.
   3. Relate principles of osmosis, hyper and hypotonicity, crenation and lysis to in vivo blood cell morphology.

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         1. Isotonic, hypertonic and hypotonic solutions
         2. Microscope
         3. Slides and cover slips
         4. Dog blood with heparin (from Vet)
         5. Latex gloves

2. Preparation for Activity/Prerequisite

1. Prepare isotonic, hypotonic and hypertonic solutions.
2. Understand microscope use.
3. Prepare coverslip specimens.
4. Define hemolysis, crenation and osmosis.

B. Description of Integrated Learning Activity:

This unit is designed to identify and correlate osmosis principles to normal physiology of body cells and to relate those same principles to common solutions used in everyday life.

C. Assessment:

1. Use of proper lab techniques
2. Interpretation of observed microscopic morphology

5. Instructor Resources/References:

Chemistry and Anatomy and Physiology Textbooks

6. Integration of Technical/Academic Courses:

Uses normal interpretation of osmosis to relate to body physiology

7. Developed by: **Date Developed/Revised: December 1995**

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Integrated Curriculum Activity
#__S-10__

1. **Discipline/Course Unit:** Fundamentals of Biology

2. **Related Disciplines:** Math

3. **Topic/Competency/Goal:** Identify information contained in graphs

4. **Integrated Learning Activity:**

   A. **Student Preparation**

      1. **Materials, Supplies, AV Equipment**

         Graph paper

      2. **Preparation for Activity/Prerequisite**

         This is a pre-lab preparation to further labs that require graph skills.

B. **Description of Integrated Learning Activity:**

Math - graph skills
Future - interr.

GRAPH EXERCISE

Plot the following points on a singe set of coordinate axes, then connect the points with segments between consecutive points to form four closed figures. Place the coordinate axes in the center of your graph paper in order to accommodate the completed figure.

I.	1.	(-0.5, 7.5)	3.	(3.5, -8)		
	2.	(-0.5, -8.5)	4.	(3.5, -7)		
II.	1.	(-4.5, 1.5)	3.	(-2.5, 0)		
	2.	(-2.5, 1.5)	4.	(-4.5, 0)		
III.	1.	(-1.5, -10)	3.	(-5, -9.5)		
	2.	(-5, -7)	4.	(-1.5, -7)		
IV.	1.	(-9.5, 14)	9.	(-6.5, -3)	17.	(3, 3)
	2.	(-8.5, 10)	10.	(-3, -5)	18.	(6, 6)
	3.	(-6, 6)	11.	(-3, -7)	19.	(6, 14)
	4.	(-4.5, 5)	12.	(-0.5, -7)	20.	(2, 10)
	5.	(-1, 3.5)	13.	(-0.5, -7)	21.	(1.5, 6)
	6.	(-4, 2.5)	14.	(3.5, -5.5)	22.	(1.5, 3.5)
	7.	(-6.5, .5)	15.	(4.5, -2.5)	23.	(-3, 9)
	8.	(-7, -1.5)	16.	(4.5, 0.5)	24.	(-6.5, 12)

COMMON ERRORS

1. No title or label on graph
2. Scale for space is too small/too large
3. Scale is uneven

C. Assessment:

(Approximately 30 minutes)

Success in creating the Playboy Bunny when the graph is completed correctly.

5. Instructor Resources/References:

Math books

6. Integration of Technical/Academic Courses:

Math skills for graphing

7. Developed by: **Date Developed/Revised: December 1995**

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